DOCUMENT RESUME

ED 223 989 CS 006 917

AUTHOR Singer, Harry, Ed.; Bean, Tom, Ed.
TITLE Learning from Text Project for 1981-1982: Conceptualization, Prediction and Intervention. Final Report.
INSTITUTION Learning from Text Project, Riverside, CA.
PUB DATE 82
NOTE 138p.; For related document see CS 006 848. Occasional marginal legibility.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *Academic Achievement; College Students; *Content Area Reading; Higher Education; Intercollegiate Cooperation; *Learning Theories; Metacognition; Models; Program Descriptions; *Reading Comprehension; Reading Skills
IDENTIFIERS California State University and Colleges; *Learning from Text Project CA; *Prose Learning; University of California

ABSTRACT

Whereas an earlier report summarized six phases of the Learning from Text Project, including expansion and organization, this final report consists of five parts: (1) explanation of a model for learning from text in a classroom situation, (2) application of the learning from text model to analysis of data for eight California campuses, (3) analysis of task difficulties in learning from text, (4) review of five collateral research projects, and (5) plans and projects for the coming year. Appendixes include reports on the following research projects: the relation of topic familiarity, textual cohesion, and syntax to the ability to read; the effect of manipulative and metacognitive questioning on high school students' learning from expository text; and the effect of diagrammed paragraphs on the comprehension and recall of history text among university students. (HOD)

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Final Report

Learning from Text Project for 1981-1982

Conceptualization, Prediction, and Intervention

Harry Singer

Project Director

UC Riverside

and

Tom Bean

Associate Director

CSU Fullerton

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Learning from Text Project

DIRECTOR
Harry Singer
School of Education
University of California
Riverside, CA 92521
714-787-3857 or 787-5228

ASSOCIATE DIRECTOR
Tom Bean
School of Human Development
Reading Program
California State University
Fullerton, CA 92634
714-773-3356

ADVISORY COMMITTEE
CO-CHAIRPERSONS
Deborah Hancock
Dean, School of Education
CSC Bakersfield

Harry Singer
School of Education
UC Riverside

MEMBERS
Tom Bean
Reading Program
CSU Fullerton

Alice Brekke
English Department
CSU Long Beach

Joe Casanova
Chemistry Department
CSU Los Angeles

Charles Frazee
History Department
CSU Fullerton

Betty Levinson
Academic Resource Coordinator
UC Los Angeles

Jane Stanbrough
UC Systemwide Administration

Ovid Tzeng
Psychology Department
UC Riverside

CAMPUS COORDINATORS
Tom Bean
CSU Fullerton

Dan Donlan
UC Riverside

Ruth Hartley
CSU Sacramento

Marjorie Holden
CSU Dominguez Hills

Adria Klein and Margaret Atwell
CSC San Bernardino

Diane Lapp
San Diego State University

Robert Ruddell
UC Berkeley

Julius Sassenrath
UC Davis

John Tibbetts and James Duggins
San Francisco State University

JOINT PROJECTS STEERING COMMITTEE
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Michael Hoffman
UC Davis

Linda Jones
CSU, The Chancellor's Office

LIAISON WITH ADMINISTRATION
Alice Cox
UC Systemwide Administration

Linda Jones
CSU, The Chancellor's Office

CAMPUS CONTENT CONSULTANTS
John Briggs
UC Riverside

Charles Frazee
CSU Fullerton

Joyce Johnson
CSU Dominguez Hills

Charles Moore
CSU Sacramento

Linda Morris
UC Davis

Other Project Participants
1981 - 1982

UC Davis Project
Carlton Spring
Caroline Turner

CSU Fullerton Project
Charles Frazee
Hallie Yopp

Representatives from other
UC/CSU Campuses and Administration
Owen Boyle, UC Berkeley
Janis Cox, UC Systemwide
Alan Crawford, CSU Los Angeles
Jack Jones, CSU San Luis Obispo
John McNeil, UC Los Angeles
Jim Richmond, CSU Chico

Project Staff, UC Riverside
Sheng-Ping Fang, Research Assistant
Linda Faulkner, Secretary
Greg Loomis, Research Assistant
Patricia Phelps, Research Assistant
Rosie Russell, Management Services Officer

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Foreword

This "final report" in an on-going project follows up and completes the July 1982 report to the Steering Committee, entitled "Learning from Text Project Report for 1981-1982." The July report summarized six phases of activity: (1) expansion of the project to three UC and six CSU campuses; (2) organization of an advisory committee; (3) dissemination activities, including initiation of LFT Abstracts, summaries of research on learning from text culled from some 10 journals, and LFT Reviews that emphasize a particular aspect of learning from text (the most recent copies are in the appendix); (4) a Lake Arrowhead Conference on Learning from Text[1]. The current report consists of five parts (1) explanation of a model for learning from text in a classroom situation, (2) application of the LFT model to analysis of data for eight campuses, (3) analysis of task difficulties in learning from text, (4) review of five collateral research projects[2], and (5) plans and projects for the coming year.

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[1]Conference Proceedings were distributed to all members of the project; additional copies may be purchased from the Bookstore, University of California, Riverside, California 92521, for $11.00.

[2]Full reports on four of these projects are in the appendix to this report; the fifth report is in Proceedings of Lake Arrowhead Conference on Learning from Text, April 14-16, 1982.

Section A

Conceptualization and Prediction of Achievement

I. Charges to the Project

The charges to the Learning from Text Project are:

1. Determine the relationship between students' ability to learn from text and their "success" in both the University of California and the California State University systems.
2. Discover ways of improving students' ability to learn from text and hence improve their success in both systems.
3. Adduce evidence on the relationship between learning from text and achievement on which policy decisions can be based.
4. Disseminate information on learning from text.

We conceptualized the charge by constructing a model on learning from text in a classroom situation.

II. Learning from Text in a Classroom Situation

Learning from text in a classroom situation involves an interaction among five components: The learner, text, test, teacher and ecological context as depicted in the diagram shown in Figure 1 (Singer, 1982)[a]. The diagram shows that the learner progresses through the text to achieve the goals of instruction, which may be defined by a test. The instructor facilitates progress to the goal by interaction with the learner, the text, and the test. Both the instructor and learner receive feedback from the test. The entire interaction process is placed in an ecological setting, which affects all aspects of learning from text.

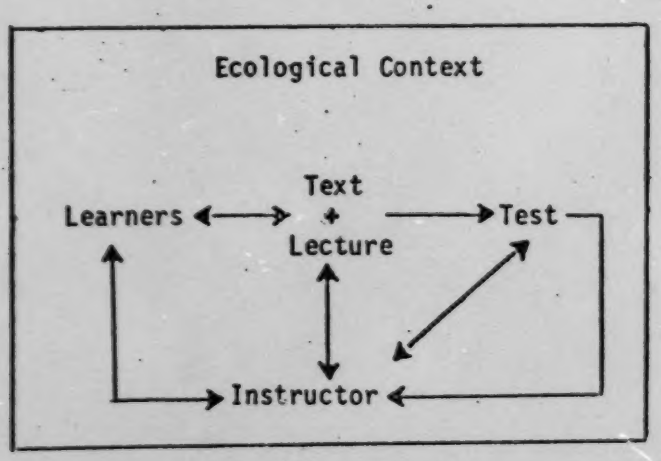

Figure 1. Diagram of Instruction and Learning from Text in an Ecological Context

[a]The diagram was reported at the Lake Arrowhead Conference and published in the Conference Proceedings. It is reproduced here because it is germaine to this report.

Although learning from text in a classroom situation is a function of five components and their interactions, as depicted in Figure 1, I shall define each component separately. I shall start with a general definition of learning and show how this definition specifically applies to learning from text.

Definition of Learning from Text

Learning is generally defined as a process that results in a relatively permanent change in behavior as a consequence of reacting to an encountered situation, provided the change in behavior cannot be attributed to maturation, instinct, or temporary states of the organism (Hilgard and Bower, 1966). I can make this general definition of learning applicable to learning from text by substituting in the definition the phrase "meaning or knowledge" for "behavior." Note that "reacting to an encountered situation" can be "interacting with text." Moreover, the way the learner interacts with text is by mobilizing resources, such as prior knowledge, reasoning processes, conceptual, lexical, syntactical, word recognition and other systems necessary for processing text. (See next section for more adequate listing of learner-based resources.) These systems can operate simultaneously with text and reciprocally with each other (Holmes, 1965; Rumelhart, 1976; Singer, 1982).

Resource mobilization is dependent not only on the demands of the text (stimulus tasks) but also on the purposes of the learner. For example, the learner may merely mobilize only those resources necessary for word identification and for attainment of only a superficial reaction to the text. Or, the learner may mobilize resources necessary not only for constructing, but also for evaluating

constructed knowledge. If the evaluation indicates knowledge is not consistent with the cumulative meaning of the text, then a feedback mechanism may operate to return the learner to the beginning of the sentence. Feedforward mechanisms, such as the effects of global context, also operate to lead the learner to constrain the meaning to be constructed.

Whatever, the result of the learner's interaction with the text, it is covert. The learner may store this covert knowledge in long-term memory and then make it overt by encoding it into oral or written responses.

If the purpose of the learner is to achieve the goal of constructing meaning for the text or new knowledge, then the learner may receive some feedback, either internally or externally, that the goal has been achieved. Internal feedback, such as perception or insight that a constructed meaning is consistent with prior and subsequent constructions of meaning, occurs during the process of interacting with the text. External confirmation or reinforcement that the learner has achieved the goal of a valid construction of meaning for a text may come as a result of a test, a grade in a course, direct feedback from the instructor to the learner perhaps during a discussion of the text, or contiguity between perception of a stimulus in the text and a response by the learner, such as text data which results in an inference, interpretation, or evaluation. Through such internal or external insight, confirmation, reinforcement or contiguity, the learner knows whether or not the goal has been

achieved. In this process, the learner, according to his or her purposes and the demands of the text, may also learn to mobilize necessary and appropriate resources.

The resources that learners can mobilize for interacting with text consist of general knowledge, semantics, conceptual abilities, reasoning processes, syntactic abilities, vocabulary and graphophonological rules. For example, to comprehend the sentence, "The cigarette caused the forest fire," readers use graphophonological, syntactic, and semantic abilities to identify the words in the text, construct meanings for them by drawing upon semantic and conceptual information stored in long-term memory, and employ reasoning processes to infer meanings that fit the sentence constraints. Readers may also generate a scenario to explain the sequence of events in the causal connection between the cigarette and the forest fire and may draw upon prior knowledge for criteria to evaluate the situation. Thus, readers construct literal meanings, make inferences and interpretations, draw conclusions and evaluate information as they process texts (Singer and Donlan, 1980).

Having made these substitutions in the general definition of learning, we can now define learning from text:

> Learning from text is a process in which learners, according to their changing purposes and demands of the task, mobilize their resources to interact with the text in order to construct meaning for the text or new knowledge which they can evaluate and then store in long-term memory or encode into oral or written responses.

Developmental Phases in Learning from Text

As students progress through school, they go through two overlapping phases in developing their ability to learn from text. The first phase, learning how to read, requires acquisition of (a) word identification processes, (b) use of language and cognitive abilities in response to text, and (c) integration of (a) and (b). The first phase is finite, that is, a student has to learn only a given number of rules for word identification processes and for employing and integrating language and cognitive processes with these rules while responding to text. Although the rate of acquisition varies, most students can learn how to read after three to six years of instruction.

However, the second phase, learning from text, continues to be developed throughout a person's lifetime. At the high school level, students acquire reader-based resources for learning from text in the content areas. They learn to identify technical terms, gain information, develop processes of thinking, and acquire knowledge of the symbols, devices, operations, allusions, and patterns of writing characteristic of the content areas.

Students must learn how to learn from text at each school level. At the elementary level, they learn how to read and begin to learn how to learn from text. At the high school level, they learn how to learn from text in various academic areas, such as science, mathematics, literature, social sciences, etc. At the college and university levels, students go on to learn more of the technical terms, knowledge frameworks, and theories that are explicit or

implicit in their texts. For example, they learn Keynesian theory in Samuelson's well-known text on economics. Later, they may learn other theories of economics. They also may become more adept at perceiving the structural organization of text and may acquire more effective strategies for learning from text.

Instructors have the task of developing students' knowledge resources and modes of discovering and critically evaluating knowledge in the various disciplines. If they also teach students strategies for mobilizing student-based resources and for deriving data from text, they are likely to enhance students' ability to interact with text. Thus, teaching students to learn from text involves an improvement in the interaction between reader-based resources and text-based information.

We have stated a definition for learning from text and given an overview of a classroom model for learning from text; we shall now explain in greater detail each component in our model. We shall start with the resources of the learner, next go on to text-based information; then to types of tests; and finally to instructional strategies.

Resources of the Learner

The resources of the learner, as shown in Figure 2, consists of cognitive capacities and processes; knowledge structures, including ideational frameworks, events, and semantic maps; syntactic structures; orthographic knowledge; phonological rules, all overgirded by metacognitive processes that are directed by motivational and affective factors and undergirded by physical and physiological

support systems. These resources may be mobilized for interacting with a text.

Metacognition: Direction and Control Factors
- Motivation
- Affective Forces

Knowledge Structures
- Semantic Maps
- Events or Propositions
- Ideational Frameworks

Syntactic Structures
- Sentences
- Paragraphs
- Larger Units of Discourse

Orthographic Knowledge

Phonological Rules

Supporting Factors
- Physical
- Physiological

Figure 2. Reader-Based Resources

Text

A text consists of any segment of print or speech that forms a unified whole. It can be divided into two parts: text structure and text content (McConkie, 1978), as shown in Figure 3. The structure or organization of a textbook type of text can be viewed from the largest to the smallest unit of the text, from chapters to graphemes.

Text-Based Data

Structure

Organization[1]
- Chapters
- Sections
- Paragraphs
- Sentences
- Words
- Spelling

Staging[3]
- Placement in hierarchical structure of passage
- Order of first mention
- Topic/Comment sentence str.
- Embedding

Aids to Semantic or Conceptual Structure
- titles, table of contents, headings, topic sentences, conclusions, summaries, tables, graphs, maps, diagrams, charts, abstracts, index, appendix

Continuum of Text Types
- Literary-Narrative: Plot: Problem/Quest/Resolution

- Rhetorical
  - Problem-Solution
  - Assertion-Proof
  - Question-Answer
  - Cause-Effect
  - Argumentative
  - Chronological
  - Definitional

- Expository
  - Inductive
  - Deductive
  - Topics

Cohesion: where interpretation of any item in discourse requires making reference to some other item in the discourse[1,2,3]
- Sentence Links
  - Additive: and, or
  - Temporal: then, next, previously
  - Adversitive: yet, though, but
  - Causal: so, in consequence, for this purpose, otherwise

- Lexical Ties
  - Grammatical: Ellipsis, Collocation
  - Lexical: Repetition, substitution

Content

Functions of Text Constituents
- Chapters and Paragraphs: New Topics, Arguments, Scenes.
- Sentences: Describe, Explain, Question, Give Order, Promise.
- Phrases:
  - Propositions: Clauses: Independent Noun and Verb Phrases
  - Noun Phrases: Objects or People
  - Verb Phrases: Kinds of Events, Actions, Relations, States
  - Adverbial: Time, Place, Causes, Purposes, Manner
- Morphemes
  - Grammatical or Bound, e.g. Plural Ending
  - Lexical or Unbound. Semantic Maps
- Spelling
  - Graphemes: Distinctive Writing Units
  - Rules for Sequence of Graphemes

- Sounds
  - Phonemes: Distinctive Sounds
    - Sequential: Consonants and Vowels
    - Suprasegmental: Intonation (Pitch, Stress, Juncture, Contour)
- Non-Verbal Cues
  - Facial Expressions
  - Rate of Speech
  - Body Position and Manner

Semantic or Conceptual Structure[4]
- Macrostructure: key ideas and their relationships.
- Microstructure: specific supporting propositions

Types of Information[5]
- Events: participants, episodes
- Non-Events
  - Setting: Time, Place, Context
  - Background: Causes, Reasons for Events, Interpretation of what is in text

Test-Based Data (cont.)

Structure	Content
	Types of Information[5] (cont.) Collateral Information: e.g. what did not happen, or what might happen later, a range of possibilities Evaluative: Comments on Morality, Relevance, Importance, Effectiveness Performatives: Uttering is also doing, e.g. I hereby pronounce you man and wife.

Figure 3. Text-Based Data Divided into Two Major Classes: Structure and Content

[1]Maclean (1979)
[2]Halliday and Hasan (1976)
[3]Grimes (1975)
[4]van Dijk (1977)
[5]Grimes (1971)

Aids to the semantic or conceptual structure of a textbook type of text consist of text and chapter titles, table of contents, headings, topic sentences, conclusions, summaries, visual aids, index, and appendix. A text can also be organized according to the way its content has been "staged," that is hierarchically structured as shown by an outline of its contents (Grimes, 1975; McConkie, 1978). Types of text vary on a continuum from literary-narrative to rhetorical and expository (Maclean, 1979). Cohesion among the parts

of a text, is achieved through sentence links and lexical ties (Halliday and Hasan, 1976; Grimes, 1975).

The content of a text consists of its macrostructure, the key ideas in a text and their interrelationships. Supporting the macrostructure are specific propositions (van Dijk, 1977; van Dijk & Kintsch, 1977). Another way of perceiving text is through its types of information, which may be categorized into events that include participants and episodes, and non-events that consist of setting (time, place, context), background (causes or reasons and interpretations for events), collateral information (what did not happen or a range of possibilities that could have happened), evaluations (comments on morality, relevance, importance, or effectiveness of events), and performatives (where the utterance is also the doing of the event, such as the minister saying, "I hereby pronounce you man and wife") (Grimes, 1971).

The functions of text parallel its structure. Chapters and paragraphs imply new topics, arguments, and scenes. Sentences may describe, explain, question, order, or promise. Each sentence consists of a proposition which contains a noun and a verb phrase. Noun phrases refer to objects or people. Verb phrases refer to kinds of events, actions, relations, or status. Adverbial phrases relate time, place, cause, purpose, or manner of action. Adjectives are either attributes or predicates; they can also be stated as propositions that have been embedded in sentences. Phrases consist of lexical elements which subdivide into bound and unbound morphemes. Each lexical ele-

ment is made up of spelling patterns, consisting of graphemes that are sequenced according to orthographic rules. When ideas are expressed through speech, the distinctive sounds uttered consist of segmental phonemes (consonants and vowels) and suprasegmental phonemes or intonations (pitch, stress, juncture, and sentence contour).

The structure and function of text may interact with the resources of the reader and the resultant information may be stored in long-term memory. But whether assessment of comprehension leads the reader to retrieve information from long-term memory and reproduce or reconstruct the information is a function, in part, of the validity of the device used for testing comprehension (Singer, 1981).

Tests

Tests or goals can be classified into assessment of knowledge of who, what, where, when, how, and why. The knowledge of why includes contextual and causal factors for explanation, and cognitive and affective criteria for evaluation.

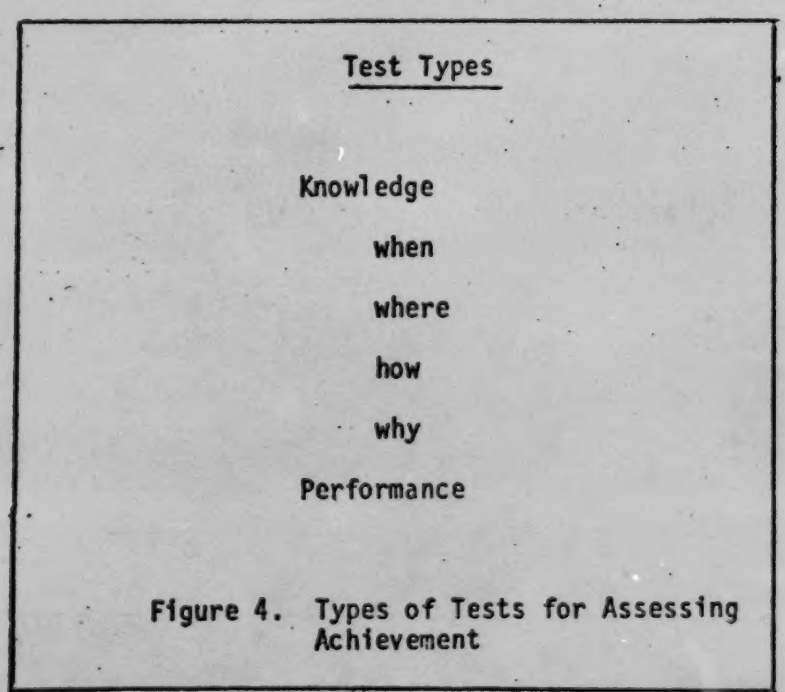

Figure 4. Types of Tests for Assessing Achievement

The skill and the art in assessment is for the instructor to construct means for determining achievement that are consistent with the stated purposes of instruction, the content of the text, and the activities and experiences provided by the instructor in the course of instruction.

Role of the Instructor

The role of the instructor is to communicate knowledge, select and devise appropriate materials and experiences for learning, construct assessment activities, evaluate learning, provide for knowledge of results, guide the learner, facilitate learning from text, and promote progress towards the goals of instruction. In teaching the student to learn from text, the instructor may enhance metacognitive or study strategies, such as teach the learner how to organize a text, generate questions for searching the text for answers and for self-assessment, construct summaries for economy in storage of information, and arrange information into hierarchical structures. The instructor may provide necessary background and contextual knowledge through lectures and collateral reading assignments, motivate and develop favorable affective responses in the learner through classroom and counseling sessions; teach the learner to identify textual components through direct instruction; provide lectures that augment, clarify, and evaluate information in the text; put the text into a contextual perspective; or communicate heuristic procedures and evaluative criteria. Thus, the role of the instructor is to achieve coherence

among all the instructional components. In doing so, the instructor can draw upon a variety of instructional strategies.

Instructional Strategies

In teaching students to learn from text, the instructor's general strategy is to help students learn ways of determining and comprehending the macrostructure of a text and its supporting microstructure as shown in Figure 5. A means to this goal is to teach

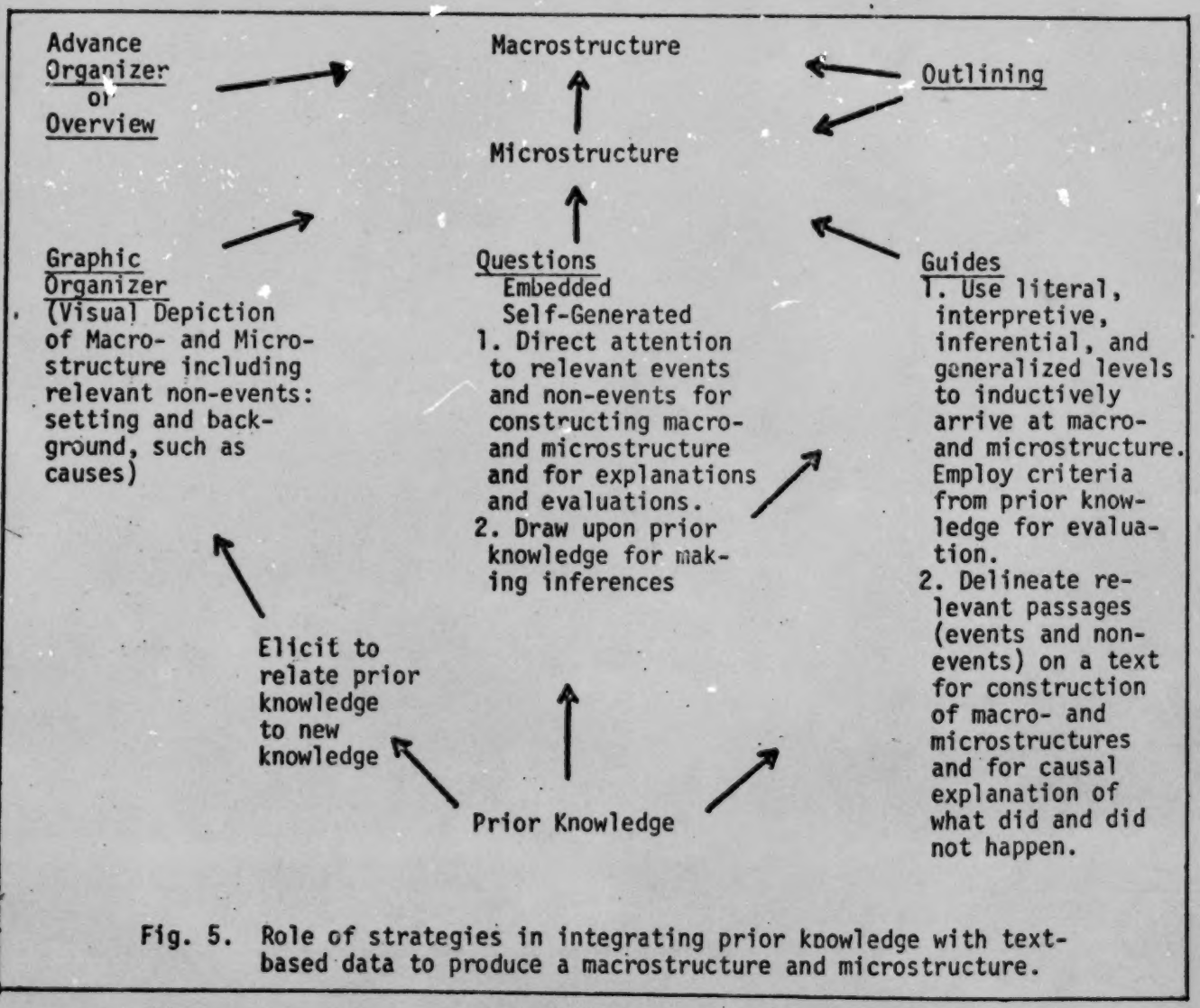
Advance Organizer or Overview
Macrostructure
Outlining
Microstructure
Graphic Organizer (Visual Depiction of Macro- and Microstructure including relevant non-events: setting and background, such as causes)
Questions
Embedded
Self-Generated
1. Direct attention to relevant events and non-events for constructing macro- and microstructure and for explanations and evaluations.
2. Draw upon prior knowledge for making inferences
Guides
1. Use literal, interpretive, inferential, and generalized levels to inductively arrive at macro- and microstructure. Employ criteria from prior knowledge for evaluation.
2. Delineate relevant passages (events and non-events) on a text for construction of macro- and microstructures and for causal explanation of what did and did not happen.
Elicit to relate prior knowledge to new knowledge
Prior Knowledge

Fig. 5. Role of strategies in integrating prior knowledge with text-based data to produce a macrostructure and microstructure.

students to recognize the text type, its function, and the kinds of information contained in the text. Instructors can then use embedded questions to focus attention on these aspects of text. They can also use a variety of adjunct aids to teach students to discern the structure and content of texts. Among them are presenting the macrostructure of a text in the form of an advance organizer such as a summary or abstract of the text, or depicting its hierarchical structure through a graphic organizer (Barron, 1969; Frayer, Frederick & Klausmeier, 1969; Thelen, 1982). Students may be taught to form a macrostructure for a text through the use of these summarization rules: formation of a generalization (use a superordinate to replace subordinate concepts), deletion (eliminate propositions irrelevant to the discourse as a whole), integration or selection (integrate one proposition with another if it can be subsumed by the more inclusive proposition), construction (create a general proposition to subsume stated propositions) (van Dijk & Kintsch, 1977). They may then devise their own graphic organizers to depict the macrostructure of the text.

Students may also organize macrostructures inductively by using reading guides (Herber, 1978) that progress from literal to interpretive, inferential, and on to generalized levels. They also may use process guides for guidance through the steps of a procedure, such as an hierarchically structured elimination process for identifying unknowns in qualitative chemistry (Singer & Donlan, 1980).

Another way of teaching students to understand a text's macrostructure is through a questioning procedure, which may start as teacher- directed questions, given either verbally or inserted in texts (Rothkopf, 1982), and end as self-directed question-generation

(Singer & Donlan, 1982). Questioning strategies can apply to either narrative or expository prose (Kintsch, 1982).

Students can aid their understanding of text not only by analyzing it into its propositions and their relationships but also by subdividing propositions into their constituent parts: noun, verb, and adverbial phrase. The elements of propositions can also be divided into lexical items. Semantic maps can be constructed for the items. A semantic map of a lexical item consists of its labels together with its properties, superordinates, coordinates, and subordinate concepts (Pearson and Johnson, 1978). Semantic maps may also be used to depict larger segments of text; including an entire story or exposition.

Regardless of the teaching strategy used, instructors should phase it in. The instructor can do so by using a strategy initially as a class procedure, then as a group process, and finally for individual assignments. Through practice, students should eventually internalize the strategy and subsequently phase out the mechanical use of it (Singer & Donlan, 1980).

Other strategies for learning from text such as outlining or underlining are also attempts to delineate the macrostructure or a text. Marginal notes may be used in a variety of ways; among them are development or elicitation of prior knowledge that students may need for making inferences, interpretations, or evaluations of the text.

Instructional strategies tend to enhance comprehension and recall of information because they lead individuals to overcome difficulties in constructing the macrostructure of a text. As a result, individuals process the relevant parts of the macrostructure of the

text more adequately. The consequence is that these parts of the text are more likely to be encoded and stored in long-term memory (Kolers, 1982).

All of the strategies operate in an ecological context. Therefore, to understand the conditions for learning from text, it is necessary to understand the ecological context and its effects on learning from text.

Ecological Context

The ecological context refers to the fact that learning takes place in a social and physical environment to which faculty and students adapt. This environment may facilitate or impede learning from text and attainment of goals. Included in the ecological context are historical and environmental factors, such as high school preparation, economic support, and family interactions that affect students prior to and during school. It also includes school factors, such as the organization of educational programs, atmosphere within a school, and the fit between students' talents or aptitudes and the demands of the program. In a broad sense, achievement is a function of a dynamic adaptation among all the components depicted in Figure 1: the learner, text, test, and instructor in a school and community environment. This broad view of learning from text provides the necessary background for understanding the rationale for the research and demonstration projects being conducted by the Learning from Text Project.

Three general hypotheses that we are testing in the project's macrostudy and microstudies are (1) a multiple set of factors in learning from text predicts achievement in both the UC and CSU systems; conversely failure to achieve is a function of reduction in one or more of these factors, (2) the greater the coherence among the factors within students' ecological systems, the greater will be the progress of students towards success, and (3) the more that students learn how to learn from text, the greater will be their achievement in the UC and CSU systems.[1] More specific formulations of these general hypotheses are being tested in the microstudies on each campus.

Summary and Conclusion

The Learning from Text Project is based upon these assumptions: Instruction in learning from text involves four major components and their interrelationships in an ecological setting, which is a fifth component. Successful achievement in both the UC and CSU systems is a function of these five components and their degree of coherence. The interrelationships among these components and successful achievement on the university systems are enhanced by an instructor who strives for coherence and uses strategies for teaching students to learn from text.

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[1]We also intend to experiment with the components in our model. For example, we intend to vary texts to determine how the variation affects student achievement. Specifically, will a text that we believe is improved yield better comprehension than the original text? Similarly we intend to experiment with test questions, instructional strategies, learner variables, and ecological factors in relationship to achievement.

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III. Model for Predicting Achievement

Drawing upon the variables in the model for learning from text in a classroom situation (Figure 1), we constructed a multiple regression equation for predicting achievement. For the first year of the study, achievement was defined by grade point average (GPA). In ensuing years, it will also be assessed by student survival and ultimately by completion of a bachelor's degree. We may interview a sample of students in this longitudinal study to ascertain their self-evaluations of "success."

The multiple regression equation is shown in Figure 6. It is based on seven factors: ability to learn from text, study methods, and ecological variables. Ability to learn from text, (STEP Vocabulary and STEP Comprehension) is measured by the Educational Test Service's Sequential Test of Educational Progress (STEP): Reading, Form 1A. Study methods are assessed by the California Study Methods Survey (California Test Bureau/McGraw Hill); it consists of three factors: attitudes and morale (motivation), mechanics of study (metacognitive strategies), and planning. Background Knowledge is indexed by High School Grade Point Average and Aptitudes are assessed by Scholastic Aptitude Tests: Verbal and Mathematics (Educational Test Service). Although course specificities is a factor in the equation, we did not assess them in the prediction of achievement in our macrostudy. The macrostudy consists of factors predictive of general achievement, not just achievement in a particular class. Our microstudies investigate achievement in particular classes. These

Ecological Context[1]

Learning from Text (STEP Voc. & Comp.) + Motivation (Carter Attitudes) + Metacognitive Strategies (Carter Mechanics) +

Planning (Carter Planning) + Background Knowledge (High School GPA) + Aptitudes (SAT Verbal and Math) +

Course Specificities[3] = Achievement (GPA or Survival)

Figure 6. Multiple Regression Equation for Relationship Between Learning from Text and Success in UC and CSU Systems

[1]Information on Ecological Context is gathered by the Biographical Inventory.

[2]Assessment measures are shown in parentheses for each factor.

[3]Course specificities are assessed in microstudies which focus on such courses as English, mathematics, psychology, history, biology, etc. See subsequent sections in this volume.

studies will be reported later in this volume. Thus our macrostudy is a global approach to satisfying the first charge to our project.

The ecological context consists of such variables as kind and quality of academic preparation, financial support, and pressures acting on students (part-time vs. full time study, family, campus resident vs. commuter). These data were collected by a Biographical Inventory completed by the students. This information is stored in our data bank, and will be used during the next year to determine the effect of ecological variables on achievement.

Thus, the first hypothesis we tested is that a multiple set of factors predict achievement in the UC and CSU systems. Although we had testing time available only for assessing learning from text and the study methods factors in our prediction equation, we were able to augment the number of factors by obtaining data from the registrar on aptitude (Scholastic Achievement Tests: Verbal and Quantitative) and background knowledge (high school GPA). These registrar data are used for admitting students to the university on the assumption that they are the best predictors of achievement at the university. Consequently, the factors selected for this study were put into competition with the registrar data because the stepwise multiple regression equation used for analyzing the data selects only those factors from a matrix that yield significant contributions to prediction of achievement. Therefore, our factors could supplement or replace the registrar's factors as better predictors of achievement.

IV. Description of the Measuring Instruments

STEP Reading

This test was standardized on a representative sample of first year college students. The test consists of two parts: vocabulary and comprehension.

Vocabulary. The vocabulary items were selected from four content areas: narrative, humanities, science, and social studies. Each item occurs in a paragraph context. Students have 15 minutes to complete 30 items.

Comprehension. The four content areas are the same as those sampled for vocabulary: narrative (passages that tell stories or anecdotes), humanities (passages concerning cultural or aesthetic affairs), science (passages concerning physical or biological sciences), and social science (passages about political science and psychology). The skill scores or cognitive tasks are (1) comprehension; recollection of sequences of ideas and facts, (2) translation and inference: ability to identify ideas in paraphrased form, apply ideas to new situations, and recognize specific inferences, and (3) analysis: ability to (a) recognize and appraise literary devices, tone, and logical structure, and (b) detect the author's purpose, attitudes, beliefs, and knowledge that influenced what he wrote. Students had 30 minutes to read the passages and answer 30 questions.

California Survey of Study Methods by Harold D. Carter. Monterey, California: CTB/McGraw-Hill, 1957

This untimed survey consists of 150 items, organized into three factors:

1. Attitudes and Morale. This factor assesses how students feel about their work while they are studying. If their attitude indicates they like what they are doing, want to learn the subject, and are confident they can do so, then they are more likely to comprehend and retain the knowledge they have acquired than if they feel the subject is not interesting, something that has been imposed on them, and perhaps too difficult. Two sample items are:

a. Do you feel what is taught in your courses is just not worth learning?	Yes	No
b. Is your reason for studying primarily a desire to increase your own knowledge?	Yes	No

2. Mechanics of Study. Some ways of studying are more effective than other ways. The items in this factor assess whether students are using the more effective methods. Sample items are:

a. Would you say that one of the most troublesome study problems is finding out just what is to be done?	Yes	No

b. When you study an assignment do you usually test yourself by trying to recite the material to yourself? Yes No

3. Planning. Studying takes time. Since students have some three to five courses and usually other activities, they have to organize their time so that they have time to learn. Some items for planning are:

a. Do you often make plans to study and then drop them because interesting activities come up unexpectedly? Yes No

b. Do you arrange a time schedule so that you do not spend too much of your own time studying for any one course? Yes No

The items in the California Study Methods scales were those that remained after successive item analyses.

Each item was validated against student grades. Those items were retained that had positive correlations with grades or were related to one of the factors on the test and contributed to its reliability.

The total scale correlates second best to general attitude with achievement. Contributing the most to this correlation is the attitudes and morale factor. In other words, it is more important how a student feels about himself or herself as a learner and the worth of studying than the particular methods or plans for studying. In short, affective processes play a strong role in influencing metacognition, those processes which direct, regulate, and monitor cognitive processes, such as memory, inference, interpretation, and evaluation.

Biographical Inventory. The 42 items in this inventory were designed to assess adequacy of background knowledge (high school courses taken and grades earned), living conditions that impinge on learning (need to work, support a family), and participation in extracurricular activities that might promote a greater identification with the educational institution and indirectly with achievement. In short, we tried to get ecological information that might be related to achievement. Some sample items are:

a. How many hours per week are you usually employed during the school year?

1. 1-10
2. 11-20
3. 21-30
4. 31-40
5. 41 or more

b. How far do you live from campus during the academic year?

1. Live in student housing
2. Live near campus
3. Live at home, within 16 miles of campus
4. Live more than 16 miles from campus

c. What was your best subject in high school? "Best" means the subject in which you earned high grades and enjoyed learning or doing the most.

1. Mathematics
2. Science
3. Social Studies
4. Foreign Language
5. English

d. What extracurricular activities did you participate in during high school?

1. Sports
2. Government
3. Drama
4. Debate
5. Other

Although we collected data on the Biographical Inventory, we have not yet analyzed the items. We need to determine which are reliable and valid, and whether they make a contribution to prediction of "success" in college over and above the contributions determined by the other factors in our test battery.

V. Subjects

The STEP and the CSMS were to be administered to a representative sample of freshmen students on each campus. We are still testing for representativeness by securing and comparing GPA and SAT mean and standard deviation scores of each sample with comparable data for freshmen classes on the respective campuses. In the meantime we note that the samples of students on eight campuses range from a high of 2.85 to a low of 2.51 in grade point average. This range does not appear to be exceptionally different from what we expected would be the mean GPA for freshmen classes.

VI. Results

The results, shown in Tables 1-14, are in the form of correlational matrices and stepwise multiple regression equations for each campus. We will use the data from CSU Fullerton, Tables 1 and 2, to explain how to read and interpret the tables for each campus.

CSU Fullerton

Table 1 shows the correlation matrix for CSU Fullerton. The table shows that 172 freshmen students were tested. The variables listed on the left-side of the table reveal that Fall GPA (grade point average) is in the last row. The correlations between GPA and the other variables are read by going across the table. The highest correlation with Fall GPA at Fullerton is High School GPA (.34), next is Carter Attitude (.31), and then STEP Comprehension (.30). These three variables also turn out to have the same rank order on the incremental multiple predictions shown in Table 2. High school GPA correlates .33 with Fall GPA at Fullerton; with the addition of Carter Attitude, the multiple correlation is boosted to .40. The next variable, STEP Comprehension, raises the multiple correlation to .44. A line is drawn under the third predictor to indicate that the addition of any more predictors is not significant.

The other columns on Table 2 show the number of students for each variable (N), the average score on the variable (M), the degree of variability (SD) (two-thirds of the students have scores that range

Table 1

Correlation Matrix

For 143-172 Freshman Students at Fullerton

1981-1982

	STEP VOC	STEP COMP	CARTER AT	CARTER ME	CARTER PL	VER SC	HSGPA	SAT V	SAT M	FALL GPA
STEP VOC	1.00									
STEP COMP	.73	1.00								
CARTER AT	.22	.19	1.00							
CARTER ME	.36	.28	.52	1.00						
CARTER PL	.11	.06	.56	.49	1.00					
VER SC	.24	.17	.66	.68	.57	1.00				
HSGPA	.20	.18	.10	.11	.99	.18	1.00			
SAT V	.70	.68	.19	.37	.00	.26	.25	1.00		
SAT M	.37	.33	.23	.24	.10	.09	.20	.52	1.00	
FALL GPA	.25	.30	.31	.22	.24	.24	.34	.20	.24	1.00

List of Abbreviations

STEP VOC = STEP Vocabulary
STEP COMP = STEP Comprehension
CARTER AT = CARTER Attitude
CARTER ME = CARTER Mechanics
CARTER PL = CARTER Planning
VER SC = Verification Score (CARTER)
HSGPA = High School Grade Point Average
SAT V = SAT Verbal
SAT M = SAT Math
FALL GPA = Fall Grade Point Average

CSU Fullerton

Table 2

Multiple Correlation Between Predictors and Criterion:

Fall Grade Point Average for Freshman

	Predictors	N	M	SD	Zero-Order r With Fall GPA	Correlations with Freshman GPA (Fall) Multiple R[1] (N=140)
1	High School GPA	162	3.19	0.37	.33	.33
2	+ Carter Attitude	172	30.00	6.67	.31	.40
3	+ STEP Comprehension[2]	172	14.48	4.92	.30	.44
4	+ Carter Planning	172	17.60	4.99	.24	.45
5	+ SAT Math	143	477.00	9.86	.24	.46
6	+ SAT Verbal —	143	418.00	9.16	.20	.47
7	+ STEP Vocabulary	172	18.88	5.06	.25	.47
8	+ Carter Methods	172	38.55	6.50	.22	.47
	Criterion Fall grade point average	171	2.51	.75		

[1]Statistical Analysis System (SAS) R^2 Program

[2]Stepwise multiple regression stopped after the third predictor

Table 3

Correlation Matrix

For 127-252 Students at CSU Dominguez Hills

1981-1982

	STEP VOC	STEP COMP	CARTER AT	CARTER ME	CARTER PL	VER SC	HSGPA	SAT V	SAT M	FALL GPA
STEP VOC	1.00									
STEP COMP	.59									
CARTER AT	.19	.17								
CARTER ME	.30	.27	.44							
CARTER PL	-.12	-.00	.38	.46						
VER SC	.08	.12	.61	.65	.44					
HSGPA	.25	.12	.02	.19	.01	.10				
SAT V	.84	.55	.21	.32	-.09	.16	.31			
SAT M	.61	.52	.18	.26	-.06	.21	.33	.70		
FALL GPA	.32	.24	.14	.20	.03	.15	.35	.39	.37	

List of Abbreviations

STEP VOC = STEP Vocabulary
STEP COMP = STEP Comprehension
CARTER AT = CARTER Attitude
CARTER ME = CARTER Mechanics
CARTER PL = CARTER Planning
VER SC = Verification Score (CARTER)
HSGPA = High School Grade Point Average
SAT V = SAT Verbal
SAT M = SAT Math
FALL GPA = Fall Grade Point Average

CSU Dominguez Hills

Table 4

Multiple Correlation Between Predictors and Criterion:

Fall Grade Point Average for Freshman

	Predictors	N	M	SD	Zero-Order r With Fall GPA	Correlations with Fresnman GPA (Fall) Multiple R^1 (N=118)
1	SAT Verbal	140	36.49	10.61	.39	.41
2	+ High School GPA	178	3.01	.47	.35	.45
3	+ SAT Math[2]	139	41.30	11.78	.37	.47
4	+ STEP Vocabulary	247	16.79	6.08	.32	.46
5	+ Carter Planning	234	18.31	6.11	.03	.47
6	+ STEP Comprehension	257	12.14	6.09	.24	.47
7	+ Carter Attitude	237	32.03	6.88	.14	.47
8	+ Carter Methods	237	37.70	6.97	.20	.47
	Criterion Fall grade point average	200	2.85	.76		

[1]Statistical Analysis System (SAS) R^2 Program

[2]Stepwise multiple regression stopped after the third predictor

Table 5

Correlation Matrix

For 47-75 Students at CSU San Bernardino

1981-1982

	STEP VOC	STEP COMP	CARTER AT	CARTER ME	CARTER PL	VER SC	HSGPA	SAT V	SAT M	FALL GPA
STEP VOC										
STEP COMP	.70									
CARTER AT	.49	.38								
CARTER ME	.47	.41	.46							
CARTER PL	.10	-.02	.60	.35						
VER SC	.38	.35	.67	.53	.54					
HSGPA	.20	.18	.25	.18	.20	.27				
SAT V	.76	.63	.31	.59	.16	.33	.18			
SAT M	.60	.53	.21	.65	.24	.35	.33	.62		
FALL GPA	.20	.20	.39	.30	.37	.42	.45	.22	.28	

List of Abbreviations

STEP VOC = STEP Vocabulary
STEP COMP = STEP Comprehension
CARTER AT = CARTER Attitude
CARTER ME = CARTER Mechanics
CARTER PL = CARTER Planning
VER SC = Verification Score (CARTER)
HSGPA = High School Grade Point Average
SAT V = SAT Verbal
SAT M = SAT Math
FALL GPA = Fall Grade Point Average

CSU San Bernardino

Table 6

Multiple Correlation Between Predictors and Criterion:

Fall Grade Point Average for Freshman

	Predictors	N	M	SD	Zero-Order r With Fall GPA	Correlations with Freshman GPA (Fall) Multiple R^1 (N= 47)
1	High School GPA	63	2.99	0.49	.45	.51
2	+ Carter Attitude	75	32.37	7.22	.39	.60
3	+ STEP Comprehension[2]	75	13.63	5.10	.20	.62
4	+ Carter Planning	75	18.52	4.68	.37	.62
5	+ STEP Vocabulary	75	17.47	6.02	.20	.62
6	+ SAT Verbal	47	38.53	9.30	.22	.63
7	+ SAT Math	47	40.53	10.03	.28	.63
8	+ Carter Methods	75	39.47	5.20	.30	.63
	Criterion Fall grade point average	74	2.75	.66		

[1]Statistical Analysis System (SAS) R^2 Program

[2]Stepwise multiple regression stopped after the third predictor

Table 7

Correlation Matrix

For 131-219 Students at CSU Sacramento

1981-1982

	STEP VOC	STEP COMP	CARTER AT	CARTER ME	CARTER PL	VER SC	HSGPA	SAT V	SAT M	FALL GPA
STEP VOC	1.00									
STEP COMP	.70	1.00								
CARTER AT	.20	.28	1.00							
CARTER ME	.22	.24	.52	1.00						
CARTER PL	.06	.11	.35	.38	1.00					
VER SC	.20	.31	.63	.61	.38	1.00				
HSGPA	.21	.27	.14	.16	.09	.21	1.00			
SAT V	.57	.66	.12	.20	.01	.20	.19	1.00		
SAT M	.29	.38	.17	.25	.01	.21	.24	.28	1.00	
FALL GPA	.26	.23	.22	.14	.17	.15	.27	.13	.00	1.00

List of Abbreviations

STEP VOC = STEP Vocabulary
STEP COMP = STEP Comprehension
CARTER AT = CARTER Attitude
CARTER ME = CARTER Mechanics
CARTER PL = CARTER Planning
VER SC = Verification Score (CARTER)
HSGPA = High School Grade Point Average
SAT V = SAT Verbal
SAT M = SAT Math
FALL GPA = Fall Grade Point Average

CSU Sacramento

Table 8

Multiple Correlation Between Predictors and Criterion:

Fall Grade Point Average for Freshman

	Predictors	N	M	SD	Zero-Order r With Fall GPA	Correlations with Freshman GPA (Fall) Multiple R[1] (N=110)
1	High School GPA	198	3.17	0.45	.27	.26
2	+ STEP Voc	196	20.02	4.78	.26	.30
3	+ CARTER PL[2]	174	18.29	6.00	.17	.32
4	+ SAT M	162	48.60	9.80	.00	.32
5	+ STEP COMP	195	15.81	4.95	.23	.33
6	+ CARTER AT	174	31.74	6.59	.22	.33
7	+ CARTER ME	174	39.58	6.05	.14	.33
8	+ SAT V	162	43.13	9.37	.13	.33
	Criterion Fall grade point average	219	2.78	.64		

[1]Statistical Analysis System (SAS) R^2 Program

[2]Stepwise multiple regression stopped after the third predictor

Table 9

Correlation Matrix

For 74-130 Students at CSU San Francisco

1981-1982

	STEP VOC	STEP COMP	CARTER AT	CARTER ME	CARTER PL	VER SC	HSGPA	SAT V	SAT M	FALL GPA
STEP VOC										
STEP COMP	.65									
CARTER AT	.27	.32								
CARTER ME	.16	.18	.46							
CARTER PL	.11	.16	.61	.47						
VER SC	.05	.05	.67	.57	.54					
HSGPA	.18	.24	.06	-.01	.06	.03				
SAT V	.70	.58	.30	.30	.16	.13	.05			
SAT M	.31	.44	.20	.17	.05	.02	.14	.32		
FALL GPA	.35	.28	.36	.15	.27	.14	.24	.28	.33	

List of Abbreviations

STEP VOC = STEP Vocabulary
STEP COMP = STEP Comprehension
CARTER AT = CARTER Attitude
CARTER ME = CARTER Mechanics
CARTER PL = CARTER Planning
VER SC = Verification Score (CARTER)
HSGPA = High School Grade Point Average
SAT V = SAT Verbal
SAT M = SAT Math
FALL GPA = Fall Grade Point Average

CSU San Francisco

Table 10

Multiple Correlation Between Predictors and Criterion:

Fall Grade Point Average for Freshman

	Predictors	N	M	SD	Zero-Order r With Fall GPA	Correlations with Freshman GPA (Fall) Multiple R[1] (N= 59)
1	STEP Vocabulary	93	19.20	4.82	.35	.44
2	+ SAT Math[2]	118	46.33	9.90	.33	.47
3	+ High School GPA	131	3.07	.41	.24	.49
4	+ Carter Methods	125	39.00	7.30	.15	.49
5	+ SAT Verbal	118	42.31	9.26	.28	.50
6	+ Carter Planning	125	18.10	4.90	.27	.51
7	+ STEP Comprehension	93	15.44	4.71	.28	.51
8	+ Carter Attitude	126	30.25	7.25	.36	.51
	Criterion Fall grade point average	135	2.67	.70		

[1]Statistical Analysis System (SAS) R^2 Program

[2]Stepwise multiple regression stopped after the second predictor

Table 11

Correlation Matrix

For 141-161 Students at UC Berkeley

1981-1982

	STEP VOC	STEP COMP	CARTER AT	CARTER ME	CARTER PL	VER SC	HSGPA	SAT V	SAT M	FALL GPA
STEP VOC										
STEP COMP	.69									
CARTER AT	.30	.26								
CARTER ME	.21	.22	.51							
CARTER PL	.14	.17	.45	.37						
VER SC	.24	.15	.66	.60	.43					
HSGPA	.36	.38	.30	.26	.20	.13				
SAT V	.74	.72	.32	.29	.10	.19	.18			
SAT M	.44	.42	.26	.21	.07	.12	-.02	.56		
FALL GPA	.32	.32	.25	.17	.14	.08	.25	.28	.24	

List of Abbreviations

STEP VOC = STEP Vocabulary
STEP COMP = STEP Comprehension
CARTER AT = CARTER Attitude
CARTER ME = CARTER Mechanics
CARTER PL = CARTER Planning
VER SC = Verification Score (CARTER)
HSGPA = High School Grade Point Average
SAT V = SAT Verbal
SAT M = SAT Math
FALL GPA = Fall Grade Point Average

UC Berkeley

Table 12

Multiple Correlation Between Predictors and Criterion:

Fall Grade Point Average for Freshman

	Predictors	N	M	SD	Zero-Order r With Fall GPA	Correlations with Freshman GPA (Fall) Multiple R^1 (N=139)
1	STEP Vocabulary	161	19.52	5.56	.32	.33
2	+ Carter Attitude[2]	161	31.10	6.64	.25	.35
3	+ High School GPA	152	3.90	5.42	.25	.37
4	+ STEP Comprehension	161	15.42	5.14	.32	.37
5	+ SAT Math	151	55.00	11.52	.24	.37
6	+ SAT Verbal	151	45.67	10.46	.28	.37
7	+ Carter Planning	161	18.53	5.02	.17	.37
8	+ Carter Methods	161	40.80	6.07	.17	.37
	Criterion Fall grade point average	219	2.78	.64		

[1]Statistical Analysis System (SAS) R^2 Program

[2]Stepwise multiple regression stopped after the second predictor

Table 13

Correlation Matrix

For 132-193 Students at UC Davis

1981-1982

	STEP VOC	STEP COMP	CARTER AT	CARTER ME	CARTER PL	VER SC	HSGPA	SAT V	SAT M	FALL GPA
STEP VOC										
STEP COMP	.61									
CARTER AT	.33	.37								
CARTER ME	.18	.27	.36							
CARTER PL	.01	.13	.35	.41						
VER SC	.07	.13	.47	.48	.46					
HSGPA	.13	.15	.15	.13	.10	.14				
SAT V	.78	.70	.38	.24	-.02	.06	.19			
SAT M	.36	.38	.30	.15	.11	.09	.30	.48		
FALL GPA	.32	.38	.47	.17	.20	.16	.33	.40	.33	

List of Abbreviations

STEP VOC = STEP Vocabulary
STEP COMP = STEP Comprehension
CARTER AT = CARTER Attitude
CARTER ME = CARTER Mechanics
CARTER PL = CARTER Planning
VER SC = Verification Score (CARTER)
HSGPA = High School Grade Point Average
SAT V = SAT Verbal
SAT M = SAT Math
FALL GPA = Fall Grade Point Average

UC Davis

Table 14

Multiple Correlation Between Predictors and Criterion:

Fall Grade Point Average for Freshman

	Predictors	N	M	SD	Zero-Order r With Fall GPA	Correlations with Freshman GPA (Fall) Multiple R^1 (N=123)
1	Carter Attitude	149	32.97	6.56	.47	.51
2	+ SAT Verbal	174	47.83	9.09	.40	.60
3	+ High School GPA	181	3.52	.39	.33	.63
4	+ Carter Planning[2]	149	19.97	5.17	.20	.64
5	+ SAT Math	174	53.80	9.57	.33	.64
6	+ STEP Comprehension	193	17.32	4.76	.38	.64
7	+ Carter Methods	149	42.20	4.51	.17	.64
8	+ STEP Vocabulary	194	21.61	3.73	.32	.64
	Criterion Fall grade point average	179	2.70	.65		

[1]Statistical Analysis System (SAS) R^2 Program

[2]Stepwise multiple regression stopped after the fourth predictor

between the mean plus and minus one standard deviation), the zero-order correlation between the variable and Fall GPA, and the multiple correlations of the predictors with Fall GPA. The other tables for the multiple correlation between predictors and criterion are to be read in the same way to determine which set of variables is most predictive on each campus.

Summary of Predictors

To summarize the predictors for Tables 1 to 14, we constructed Table 15. It contains the rank order of the first three predictors of GPA for each campus. The predictor occurring most often, regardless of rank, is High School GPA (7 times). The next most frequent occurring predictor is Carter Attitudes (4 times). The STEP Test Predictor, (Vocabulary, is third. Comprehension and SAT (Verbal and Math) are tied for fourth (2 predictors each). Second last is Planning (1 time) and last is Mechanics (0 times).

From these predictors, we would infer that past academic performance (High School GPA) is the best predictor of future academic performance (Freshmen GPA). This prediction is enhanced by a favorable attitude and morale in learning (Carter Attitude). Next comes ability to learn from text, STEP Vocabulary, and then Comprehension and general aptitude (SAT Verbal and Math). Ability to organize activities and have time to learn (Planning) comes close behind. Last is methods of studying (Mechanics).

Table 15

Rank Order of Predictors for

Fall GPA on Eight Campuses

	CSU[a]					UC[b]		Sum
	F	DH	SB	SAC	SF	B	D	
High School GPA	1	2	1	1	3	3	3	7
CSMS Attitudes	2		2			2	1	4
STEP Voc.			3	2	1	1		3
STEP Comp.	3							2
SAT Verbal		1					2	2
SAT Math		3			2			2
CSMS Planning				3				1
CSMS Mechanics								0

[a]San Diego State did not have registrar data available when this table was constructed.

[b]The data for UC Riverside are still being collected.

These data reinforce the use of High School GPA as the best predictor of college GPA. They also indicate that the California (Carter) Survey of Study Methods, particularly its subcomponent of Attitudes, would add to the predictive validity of college achievement. What is important to attainment of achievement is not only past achievement and current ability and aptitude, but also the desire to learn, know, and remember. These factors are more important than specific methods of studying for predicting achievement.

The data also show that the STEP Reading test is also as predictive in general of freshman GPA as the SAT Tests. The STEP variables correlate highly with SAT Verbal, but much lower with SAT Math.

If we count STEP Vocabulary and SAT Verbal as being comparable and add their rank on our summary data, they would then rank second, behind High School GPA, as a predictor of freshman GPA. The power of vocabulary ability to predict freshman achievement is not surprising because freshman courses entail a wide range and density of technical terms that students have to learn. The STEP Test does not just assess their knowledge of vocabulary, but also their ability to infer the meaning of terms as they are defined in context.

The STEP Comprehension Test ranks third on two campuses. Perhaps if more openbook examinations were given as a basis for determining grades, STEP Comprehension might then rank higher on more campuses.

We can determine the factors that operate in the STEP Test by contrasting easy vs. difficult items on it. This contrast is

analogous to a comparison of students whose scores are high versus those whose scores are low in ability to learn from text.

Easy vs. Difficult STEP Test Items

The rank order of difficulty of STEP items for the Fullerton students correlated .92 and .93 respectively, on vocabulary and comprehension, with item ranking for the STEP Tests norm group. The three easiest vocabulary items were (1) adamant (Item 1, 92% correct), (2) conclusive (Item 2, 91%), and (3) alienated (Item 3, 94%). The three most difficult items were (1) pedant (Item 28, 21% correct), (2) chauvinism (Item 29, 31% correct), and pedestrian (Item 30, 14% correct).

Items may be easy because they occur more frequently or the context defines them more readily. For example, the context clarifies the meaning of adamant:

> Although the administrators argued, pleaded, and threatened, the doctors were adamant and continued with their experiments. Adamant means
>
> A. intimidated
> B. dejected
> C. furious
> D. unmoved

Items may be more difficult because they occur less frequently in precollege texts and consequently are less likely to be learned or

because they may draw upon a less common meaning of a multiple meaning term as was the case for pedestrian. This item also requires the testee to infer the meaning and then select the term that represents this meaning. Consequently it involves both reading comprehension processes and vocabulary knowledge. The item is reproduced below.

> Most of the letters are full of perfunctory descriptions, dutiful replies, and a vast flatsam of trivia.
>
> The letters are:
> A. pedestrian
> B. informative
> C. discourteous
> D. businesslike

Thus the ability to infer the meaning of terms from context or organize the meaning of a passage under a general category and having a greater repertoire of vocabulary knowledge to draw upon differentiates higher from lower achieving college students. Hence, ability to learn vocabulary from text and use acquired vocabulary for organizing and interpreting information presented in a text are predictive of success in college. Therefore, the STEP Vocabulary test is a significant diagnostic tool.

The comprehension passages consist of relatively lengthy selections. The three easiest comprehension items were (1) attaining the central idea of a science passage (Items 14, 78% correct), (2) perceiving the relationship between a superordinate concept and instances of that concept (Item 18, 75%), and (3) drawing an inference

for an analogy in a narrative passage (Item 20, 73%). The three most difficult items were (1) an inference based on a prior translation of a narrative passage (Item 22, 16%), (2) a complex series of inferences and perception of relationships in a political science passage that also involves prior translation of the meaning of an idiomatic expression (Item 25, 14%), determining the tone of an author's discussion in a political science passage and knowing the meaning of an evaluative term, "detached" (Item 26, 18%).

Comparing the easy with the difficult comprehension items, we note that the cognitive processes required are not different. But what is different is that the easy items tend to involve fewer cognitive processes. Although some students may have difficulty in applying cognitive processes of making inferences, interpretations, evaluations, and integrating knowledge, what seems to differentiate the lower from the higher achievers is the ability to orchestrate their cognitive processes. That is, the ability to direct and regulate them in an appropriate sequence to solve a problem and reach a goal established by a question posed by the text. This ability is known as metacognition. In short, the differences between the low versus the higher achievers is not so much in their cognitive but in their metacognitive abilities. For example, in a passage on memory, which contains an easy comprehension item, the author asks, "What is memory on a molecular basis, if indeed there is a molecular basis?" Two paragraphs down, the author answers the question. The paragraph

starts: "Here and there in the literature there are clues." The paragraph then cites the clues, first describing "the DNA molecule" and "an antibody." The passage then states: "I see no reason why there cannot be a molecular basis for memory." Students then have little difficulty in answering this question:

The author cites DNA and antibodies as

A. Kinds of molecules found in nerve cells
B. Support for the theory, that memory has a molecular basis.
C. Evidence of our lack of knowledge about memory.
D. Simpler forms from which the memory molecules has evolved.

To choose the correct answer, a student must notice the phrase that is common to the text and the question, "memory on a molecular basis" and "memory has a molecular basis," realize that the term "cites" is tantamount to the introductory phrase, "there are clues" and then perceive that "the DNA molecule" and "an antibody" are two of the clues mentioned in the paragraph and in the question asked by the problem. The cognitive processes involved might be simply remembering what the author said, or establishing an identity relationship between the text and the question, only noting that the structure in the text is inverted in the question. Essentially the student must perceive a hierarchical structure, the relationship

between a superordinate concept", "molecular basis" and instances of that concept, DNA and antibodies.

The most difficult passage consists of political science content. It deals with the criteria for a political party's selection of a candidate to run for president. The question about the passage requires the student to translate a proverb: "A wild cat in the chamber is more dangerous than a lion in a distant desert." To answer the question, the student must realize that the explanation of the proverb is in the text, "a nearer danger is a greater danger," and then the student can use analogical reasoning to determine how "danger" applies to the political party and what "nearer" means in the context of nominating and running a candidate for the presidency. In choosing the correct answer, they have to relate the candidate's ability to get elected to the party's welfare. Although the reasoning processes involved are similar to those in the easier passage, the number of steps or processes that must be used is greater.

In short, low and high achievers at the college level do not seem to differ in their cognitive, but in their metacognitive processes, particularly as the number of steps or cognitive processes involved increases.

We can also view the STEP Comprehension test as a miniature class-room situation. The instructor asks a question, the students read the text to find the answer to the question, and then indicate their answers on the test by selecting one of the choices. A similar situation occurs when the instructor gives an assignment: the

students go to the library to find the answers and submit them in the form of a term paper or write them on an essay exam. Some of the tasks assigned may be one-step, such as look up the answer in a catalogue, others may be more complex, involving getting diverse views on a controversial issue, weighing them, and reaching a judgment. Students do not seem to differ in ability to carry out one-step tasks, but are more likely to differ in multiple step processes.

Metacognitive abilities also interact with motivational and emotional factors, which are assesed on the CSMS. The persistence, depth, and degree of integration achieved on the more complex problem is determined by an interaction among metacognitive, cognitive, and motivational-emotional factors. The student who is more confident and has a positive attitude about a task is not likely to get the interference in cognitive processes that occurs when a student feels doubtful, disinterested, and merely dutiful in carrying out the task.

Thus, our three predictors of achievement at the college level tend to interact: Background knowledge or previous achievement, as indexed by High School GPA; attitudes towards learning and self-concept as a student as measured by CSMS; ability (vocabulary knowledge, and cognitive and metacognitive factors) as assessed by the STEP Vocabulary and Comprehension tasks.

VII. Policy Implications

Although our three predictors do not account for all the variance in freshmen "success" (achievement), their combined prediction is greater than any one predictor. Hence, if any selection is to be made for honors classes, as UCLA currently does, or for remedial treatment as some have proposed (Spring, 1982)[1], it should be based not upon a single predictor, but upon multiple predictors; specifically, high school GPA, attitudes, and vocabulary ability.

Instructors of courses should ascertain whether students have the necessary entry level knowledge, whether students have a positive attitude toward the course and their ability to succeed in it, and whether they have the necessary cognitive and metacognitive abilities for doing the tasks at the level set by the instructor. These factors, however, are not fixed; they are variables that are somewhat under the instructor's control. The instructor or the college can select students who have these factors already, and to some extent that is done by admission policies (High School GPA and SAT scores). However, variation in these factors still remains among those students who pass the selection process. To adapt to the variation in Background Knowledge, the instructor can start at the students' entry level background knowledge or advise students on how to attain it on their own. The instructor also plays an important role in developing attitudes towards the content of the course, the assignments, and the students' self-conceptions about their ability to succeed in the course. Whether students succeed or not also depends on whether they

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[1]Carl Spring, Samuel Neustadt, Julius Sassenrath and Virginia Martucci. Incidence of low reading comprehension among 1981 UCD freshmen. Technical Report No. 3. University of California, Davis: Basic Skills Research Program, July, 1982.

acquire the metacognitive strategies necessary for the difficulty level of tasks set by the instructor. Although students may have already acquired some of the necessary metacognitive abilities, instructors at the college level have to develop the necessary knowledge structures and framework for comprehending the subject at the level of abstraction required at the college level and teach students the particular metacognitive strategies for comprehending written or orally-delivered texts. At the college level, students are not only expected to learn, for example, economics, but various theories or explanations of economics and their uses and limitations. Eventually they learn to discern on their own the theory or theories that underlie texts. Instructors thus have a complex role that begins with the selection of a text[1], the organization of a course, its assignments, suggestions or strategies for achieving in the course, and construction of examinations that are coherent with (a) the knowledge or processes taught through text or lectures and lab and (b) the goals of the course.

A second task for the learning from text project is to adduce evidence on ways to improve students' ability to learn from text and enhance their degree of success at the university. This charge brings us to our second hypothesis:

> The greater the coherence among the factors in a classroom situation, within a given ecological context, the greater will be the degree of student achievement.

[1]See LFT Review in appendix for information on text selection.

This hypothesis was tested in the form of intervention studies in collateral research projects. These intervention studies and other types of collateral research projects are summarized in the next section.

Section B

Collateral Research Projects:

Intervention and Other Types of Studies

Classroom Projects

Each of the nine campuses had a commitment to conduct a self-determined collateral research project. Their proposed research is listed in Table 16.

One of these projects, San Bernardino's, involves further analysis of its data to determine differences between older and younger students enrolled in freshmen courses. A unique factor in the San Bernardino student body is that it has a relatively high percentage of students who are starting college for the first time, some 8 to 10 years after completing high school. The results of this investigation will be reported later in a separate paper. Sacramento's collateral research project which consists of an item analysis, will also be reported later. Dominguez Hills conducted a questionnaire-survey of its faculty to determine which instructors were already teaching students strategies for learning from text. We do not yet have this report. Nor do we have the one from San Francisco State on the learning from text abilities of older and younger students just beginning programs in teacher education.

But we do have reports from five other campuses. We will briefly review them here. Their complete reports are in the appendix.

Fullerton. This campus has designed an intervention project for a 10th grade history class at Garden Grove High School in Garden Grove, California. The instructor, Jack Sorter, has two history classes for high achieving students, students who are likely to go on to CSU Fullerton, as many from Garden Grove High School now do. The fall and spring were spent in negotiating permission with the school district for the study, and having a teacher volunteer to engage in

Table 16

Project Reports from Nine Campuses

1. CSUC San Bernardino: Peggy Atwell and Adria Klein

The purpose is to determine the effects of students' years out of school on the learning and retention of text. Variables include age, sex, years out of school, jobs held, career goal, and activities out of school. Approximately 75 students in freshman English classes participated in this study.

2. CSUC Dominguez Hills: Marjorie Holden

A questionnaire on teaching students to learn from text was distributed to all faculty. Most faculty returned the questionnaire. The results will be analyzed and reported in the fall.

3. CSU Fullerton: Tom Bean, Harry Singer, Jack Sorter, and Charles Frazee

Plans were formulated and negotiations conducted for a year-long study on teaching 10th grade students at the high school level to learn from their texts in World History. The long range plans for this project call for a longitudinal study to determine whether this instruction at the high school level articulates better with instruction in history at the university level. Extramural funding is being sought for this project.

4. CSU Sacramento: Ruth Hartley

Correlations will be computed between items on the STEP Test in the various subject areas with grade point average in each subject area.

5. San Diego State University: Diane Lapp and James Flood

The purpose of this study is to investigate the relation between student's prior knowledge, syntactic competence, textual cohesion and college reader's comprehension of cause-effect expository texts designed to assess three variables: topic familiarity (as a measure of knowledge), cohesion (as a measure of discourse structure type) and syntax (as a measure of language development).

Table 16
(continued)

6. San Francisco State University: James Duggins and John Tibbetts

To test all entering teacher candidates in Secondary Education prior to their participation in a basic course in the teaching of reading, which is required of all secondary teacher candidates. The same battery of tests will be administered (Reading STEP 1A and the Carter Study Methods Survey) and GPA data gathered.

The purpose of this study will be to ascertain if students (largely graduate students with a few possible upper division students) selecting teaching as a career are significantly different in reading ability and study skills from the typical freshman population at San Francisco State University.

7. UC Berkeley: Robert B. Ruddell and Owen Boyle

The purpose of this project is to test the hypothesis that a combination of instruction in cognitive mapping, development of flexibility in reading, and improvement in vocabulary skills will result in significantly greater achievement in the experimental group's grade point average in the course and in its overall grade point average as compared with a control group. The writing ability of the two groups will also be compared to determine whether the instructional treatments also statistically differentiate the two groups on this dependent variable.

Both groups were enrolled at UC Berkeley in English 1A, 1B, and Subject A during the Spring 1981 semester. Approximately 30 students will be in each group. But the treatment group consists of volunteers enrolled in an adjunct course that meets 1½ hours/week for the entire quarter.

8. UC Davis: Julius Sassenrath

Effect of interspersed questions in a biology text will be used to determine whether they had any significant effect on enhancing student achievement.

Table 16
(continued)

9. UC Riverside: Dan Donlan

Students enrolled in a history course will be randomly assigned to experimental and control groups. The experimental group will receive instruction on differentiating content in a history text on Cuba into an hierarchical structure. (See teaching strategy in section on Three Simultaneous Seminars.) Both groups will be assessed on criterion-referenced tests and written recall of assigned material. Hence, the effect of the instructional strategy will be evaluated on two criteria: comprehension and writing ability.

it. The summer was spent in designing the project, preparing the materials, and training the teacher. The project is co-directed by Tom Bean and Harry Singer. Charles Frazee, Professor of history at CSU Fullerton, is the project's consultant.

The instructional strategy consists of teaching the experimental group in the first six weeks of the class to generate their questions for learning history based upon summarization rules; meanwhile, the control class will be learning to answer teacher-generated questions based on the summarization rules during the first six weeks and then self-generation of questions during the second six weeks. Criterion referenced questions will be given both groups at the end of each week. An attitude reaction scale will be given to both groups at the end of the six week period.

In the second six weeks the experimental group will be taught to use graphic organizers. The control group will be offset by six weeks in acquiring this strategy. Thus, we will determine (a) whether the experimental interventions will yield significantly higher levels of achievement and more favorable attitudes towards history, (b) whether the treatments will be cumulative, and (c) whether the treatments will have some short-range transfer effects to subsequent courses in history, and if they do, (d) we will subsequently attempt to find out when these Garden Grove students attend CSU Fullerton whether the experimental treatments in their high school classes also have long-range effects in their university history courses.

UC Riverside. An exploratory study by Dan Donlan, Harry Singer, and Carlos Cortes was conducted on an adjunct volunteer history class. Seven students learned to organize graphically the content of a short text on the history of Cuba. Criterion-referenced tests given each week revealed the control group consistently scored better than the experimental group throughout the six sessions. Possible reasons for the results could be (a) initial differences in the composition of the two groups, (b) the experimental group did not adequately learn the strategy in the six weeks, or (c)the strategy interfered with the experimental group's learning of the content on which they were tested. The study will be re-done next spring.

UC Berkeley. Owen Boyle and Robert Ruddell taught freshmen English students cognitive mapping, flexibility in reading, and vocabulary development. They are currently evaluating the effects of this global treatment on students' grade point averages and writing ability.

UC Davis. Julius Sassenrath found that interspersed questions in a biology text did not significantly improve students' achievement at midterm time. But, a subsequent study that reversed the experimental and control groups in the second half of the course, found that the new experimental group performed significantly better on the final exam.[1] The investigators attributed the differences to the fact that the second half of the course covered more difficult material (theories of genetics and evaluation) than the first half (descriptive material) and that the interspersed questions were more helpful only on the relatively difficult material. Dr. Sassenrath and the biology professor who taught the course will be redoing the first part of the study to determine whether more appropriate questions will also yield significant differences in the first half of the course.

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[1]Carl Spring, Julius Sassenrath, Hendrik Ketellapper, and Samuel Neustadt. The effect of adjunct questions on learning from text in a college biology course, (Technical Report No. 8). Davis, California: Basic Skills Research Program, University of California, Davis, October, 1982.

Section C

Dissemination

The LFT Project has a charge to disseminate information. We have defined the charge broadly: we disseminate information from the LFT Project and from wherever we can glean knowledge on learning from text at the university level. We have used five ways of disseminating information.

LFT Abstracts

Each month during the academic year we search through some 10 journals for research on learning from text. We then reproduce abstracts of some of this research; the remaining references are listed. We mail the LFT Abstracts to all of our campus coordinators and their co-principal investigators, to all directors of learning assistance centers in UC and CSU systems, members of the LFT Advisory and Steering Committee, and to all UC and CSU faculty who request a place on our mailing list. Some 100 names are now on the list. All these people also receive the LFT Reviews.

LFT Reviews

From time-to-time a staff member of the project writes a brief review of a particular research topic. For example, this month we wrote a review of research on text selection. The review explains empirical procedures and criteria for selecting a text for beginning students. The text that instructors of a course preferred was not the

text students liked the most. The instructors wanted a terse text, written at a relatively high level of abstraction with relatively few examples. The students found a text that had more explanation and more examples fit their needs better. The instructor then wrote a chapter based on student preferences and found students learned better from this chapter than they did from comparable chapters in either text. Thus, the instructor empirically discovered the characteristics of a text that resulted in higher achievement. Although instructors can not always experiment with texts, they can use criteria for selecting texts that are appropriate for students. Among the criteria are texts that are related to students entry level knowledge, use examples that bridge the gap between what students know and what they need to learn, and explicate relationships and ideas.

Conferences

Members of the project delivered reports on their research at various professional meetings.

Professional Meetings for 1982-1983

1. California Reading Association, San Diego Convention Center, November 4-6, 1982. Harry Singer, Tom Bean, Charles Frazee, Jack Sorter, Dan Donlan, Owen Boyle, and Robert Ruddell gave reports on the LFT projects.

2. National Reading Conference, St. Petersburg, Florida, December 2-4, 1982. Tom Bean and Harry Singer will deliver a paper on their LFT high school project.

3. International Reading Association, Preconvention Institute, Convention Center, Anaheim, California, May 2, 1982. Reporting are project members, Harry Singer, Tom Bean, Owen Boyle, and Dan Donlan; and professors who have been engaged in research on learning from text: Irene Athey, Dean, Rutgers University; George McConkie, Professor, University of Illinois; Rob Tierney, Center for the Study of Reading, University of Illinois; Jean Dreher, University of Maryland, College Park; and Judie Thelen, Frostburg State College, Maryland. Assisting in practice-demonstrations on strategies for learning from text will be Nancy Rogers-Zegarra, Charlotte-Mecklenburg School District, Charlotte, North Carolina; Virginia Berry, Merle S. Casey School, Rialto Unified School District, California; Pat Phelps, University of California, Riverside; Hallie Yopp, University of California, Riverside and Laurel School, Brea-Olinda Unified School District, California; and Ruth Nolte, University of California, Riverside and Fanning School, Brea- Olinda Unified School District, California.

Copies of the three programs are in the Appendix.

Professional Meetings for 1981-1982

Last year Tom Bean and Deborah Hancock reported on the project at the California Reading Association and Deborah Hancock talked about the project at the International Reading Association's Annual Meeting in Chicago. Tom Bean and Harry Singer presented information about the project at the Western College Reading Association's Meeting in San Diego.

Lake Arrowhead Conference in Learning from Text

A conference consisting of all members of the project plus John Briggs, Assistant Professor of English at the UCR campus, was held at Lake Arrowhead. The Conference Proceedings were multilithed by the LFT Project and are available for purchase through the UCR Bookstore.

Plans for Additional Dissemination

1. Technical Reports. As the members of the project complete reports on their projects, they will be disseminated to all those on our mailing list.

2. LFT Anecdotes. We anticipate collecting and disseminating interviews with professors who teach, explain or demonstrate to their students how to learn from text.

Section D

Research Plans for 1982-83

The funds available for 1982-83 will cover these projects:

1. Trend data at UCLA (Betty Levinson) and CSU LA (Alan Crawford). They will each collect data on representative samples of freshmen studnets on their campuses. Hopefully, they will collect the data for three successive years. These campuses will serve as yardsticks for answering the question: What is the trend on High School Achievement, STEP Test, California Survey of Study Methods, Ecological Variables, SAT Scores, and freshmen GPA? Total cost, $1,000.

2. Campus coordinators. Alan Crawford, CSU LA, and John McNeil, UCLA, have been designated as campus coordinators. Professors Alan Crawford and Elizabeth Hake, English department, have already submitted a collateral curricular research project. Cost per campus: $1,250.

3. Continuation grants. Each campus that participated last year is eligible for a $500 continuation grant to
    a. Interview a sample of tested students on their ability to learn from text.
    b. Identify and interview professors who teach students to learn from text.
    c. Follow-up samples of students tested on each campus last year to determine the extent to which they

have improved in attitude and ability to learn from text as a result of the total university "treatment," viz., instruction in freshmen courses. These students will retake the STEP tests and CSMS inventory.

4. Add CSU Bakersfield (Dean Deborah Hancock) to interview students and their professors on strategies for learning from text. Cost: $500.

5. Competitive proposals. Campus coordinators and co-principal investigators will be eligible to submit proposals that will be judged and selected by the LFT Advisory Committee. These proposals will be on one of the topics specified below. Each of these topics represents a follow-up to questions that the LFT Project found last year it needed to investigate. Most of the projects submitted so far involve curriculum intervention and have possibilities of developing curriculum exportable materials. A total of six proposals at $1,000 can be funded.

   a. Followup study on the students tested as freshmen. Retest a sample, interview them and their freshmen instructors on learning from texts in different content areas, not only content and reading processes, but also metacognitive strategies and attitudes.

b. Experimental, controlled studies on instructional procedures based upon first year data on background knowledge, attitudes to learning, and STEP comprehension.

c. Selection of freshmen texts; relation between predictors of achievement and achievement in learning from assigned texts. Interview instructors on how they appraise the texts they selected, how they would learn from it, what advice they give to students on learning from text, and relationship between the text and exam, lectures and exam, and outside assignment and exam.

d. Construction and validation of texts; for example, modifying text to relate to background knowledge; use of graphic organizers; "marginal" glosses; inserted questions on cognitive structure involved in the text; prediction; question-generation; summarization strategies.

e. Studies on instructors identified as already teaching students to learn from text. Do these students achieve better than a control group? Do

they transfer what they learn to another course in the same content area? To a related content area?

f. Construction of diagnostic test in a particular content area. May be criterion-referenced or norm-referenced. Collection of reliability and validity data on the test.

Thus, LFT will be sponsoring projects in 1982-83 probably on 5 to 6 CSU campuses and 4 UC campuses. It is likely to have 8 curricular projects, two testing projects, 6-7 followup projects, and one exploratory project for a total of 15 to 16 projects.

Appendix

Conferences for

1982-1983

University of California and California State University

Joint Projects Steering Committee

LFT

Learning from Text

DIRECTOR
Harry Singer
School of Education
University of California
Riverside, CA 92521
714-787-3857 or 787-5226

ASSOCIATE DIRECTOR
Tom Bean
School of Human Development
Reading Program
California State University
Fullerton, CA 92634
714-733-3356

ADVISORY COMMITTEE
CO-CHAIRPERSONS
Deborah Hancock
Dean, School of Education
CSC Bakersfield

Harry Singer
School of Education
UC Riverside

MEMBERS
Tom Bean
Reading Program
CSU Fullerton

Alice Brekke
English Department
CSU Long Beach

Joe Casanova
Chemistry Department
CSU Los Angeles

Charles Frazee
History Department
CSU Fullerton

Betty Levinson
Academic Resource Coordinator
UC Los Angeles

Jane Stanbrough
UC Systemwide Administration

Ovid Tzeng
Psychology Department
UC Riverside

CAMPUS COORDINATORS
Tom Bean
CSU Fullerton

Dan Donlan
UC Riverside

Ruth Hartley
CSU Sacramento

Marjorie Holden
CSU Dominguez Hills

Adria Klein and Margaret Atwell
CSC San Bernardino

Diane Lapp
San Diego State University

Robert Ruddell
UC Berkeley

Julius Sassenrath
UC Davis

John Tibbetts and James Duggins
San Francisco State University

JOINT PROJECTS STEERING COMMITTEE
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UC Davis

Linda Jones
CSU, The Chancellor's Office

LIAISON WITH ADMINISTRATION
Alice Cox
UC Systemwide Administration

Linda Jones
CSU, The Chancellor's Office

CAMPUS CONTENT CONSULTANTS
John Briggs
UC Riverside

Charles Frazee
CSU Fullerton

Joyce Johnson
CSU Dominguez Hills

Charles Moore
CSU Sacramento

Linda Morris
UC Davis

California Reading Association's Annual Meeting, San Diego, California, November 4-6, 1982.

Symposium:

Harry Singer
A Model for Predicting Achievement in UC and CSU Systems

Tom Bean, Harry Singer, Charles Frazee, and Jack Sorter
Articulation of Instruction in Learning from Text in High School and College History

Dan Donlan and Harry Singer
The Effect of Graphic Organizers on Comprehension of a College History Text

Robert Ruddell and Owen Boyle
Mapping Technique in English Classes

Session A4, on Thursday, 9-11:30 a.m. (see Conference Program for location)

1982 National Reading Conference
Clearwater, FL Wed. 1 Dec.-Sat. 4 Dec.

PAPER Proposal Cover Sheet
(Use other side for Symposium)

1. Person submitting this PAPER proposal
   Name Dr. Thomas W. Bean

2. Full title of paper as you wish it in program
   Title The effect of manipulative and metacognitive questioning on high school students' learning from expository text

3. Principal author:
   Same as 1 X or Name

   2nd author: Name Dr. Harry Singer

   3rd author: Name Mr. Jack Sorter

4. Paper will be presented by:
   Same as 1 X or Name

5. Time request for presentation of paper:

   X Normal paper presentation time (20 min.)

   ___ Twice normal presentation time (40 min.) Give reasons for additional time request in comment section below.

   ___ One full time block (1 hr. 20 min.)

6. Major emphasis of this paper is best classified as:

   Psychological processes ___; College-Adult ___; Elementary ___; Secondary X ;
   Teacher Education ___; Other ___ Specify ___

7. Additional comments which might aid the Program Committee in evaluating this proposal: (need for additional time, relation to other papers or topics, continuation of prior work, etc.)

   This is the first short-range study in a proposed series of studies supported in part by the UC-CSU Learning From Text Project (Dr. Harry Singer, Director; Tom Bean, Associate Director) and a grant to the first author.

8. Checklist for proposal submission:

   ___ Cover sheet, 3 copies
   ___ Abstract, 3 copies single-sheet (200-300 words)
   ___ Data card (1) for each person named on this sheet
   ___ Envelopes (3) stamped and addressed to person listed on line 1

SEND ALL MATERIALS BEFORE 15 APRIL 1982 to; Dr. Irene Athey
Graduate School of Education
Rutgers University
10 Seminary Place
New Brunswick, NJ 08903
Attention: NRC Program Proposal

PRECONVENTION INSTITUTE 24

MONDAY, MAY 2-TUESDAY, May 3

LEARNING FROM TEXT

Intended for teachers, supervisors, curriculum specialists, and researchers, grades 4-12. Special registration is required, with a limit of 100 registrants.

Chairing: Deborah Osen Hancock, California State University, Bakersfield

HILTON AT THE PARK, GARDEN ROOM

Monday/10:00-12:00 Noon

Introduction, Overview
Harry Singer, University of California, Riverside
Discussant: Irene Athey, Rutgers University

Learning from Text: Evidence on Ways to Improve Comprehension
George W. McConkie, University of Illinois, Urbana-Champaign
Discussant: To be announced

Monday/1:30-5:00*

Summarization, Rules, Graphic Organizers, and Question-Generation Strategies for Teaching High School Students to Learn from Text
Demonstration-Practice
Coauthors of the Project are Thomas W. Bean, California State University, Fullerton; Harry Singer; Charles Frazee, California State University, Fullerton; and Jack Sorter, Garden Grove High School, Garden Grove, California

Learning to Judge the Relative Importance of Content in a History Text at the College Level and Its Effect upon Reading Comprehension
Demonstration-Practice
Dan Donlan, University of California, Riverside

Tuesday/9:00-12:00*

Graphic Organizers for Relating Reader's Prior Knowledge to New Knowledge in Texts
Demonstration-Practice
Judith N. Thelen, Frostburg State College, Frostburg, Maryland

Mapping Ideas in Texts: Its Effect on Reading and Writing
Demonstration-Practice
Owen Boyle, University of California, Berkeley

Assisting in Demonstration-Practice:
Nancy Rogers-Zegarra, Charlotte-Mecklenburg School District, Charlotte, North Carolina
Pat Phelps, University of California-Riverside (UCR)
Ruth Nolte, UCR and Fanning School, Brea-Olinda Unified School District, California
Hallie Yopp, UCR and Laurel School, Brea-Olinda Unified School District, California
Virginia Berry, Merle S. Casey School, Rialto Unified School District, California

Summary
Mariam Jean Dreher, University of Maryland, College Park

Conclusion
Harry Singer

*Coffee breaks will be from 3:00-3:30 on Monday, and from 10:30-11:00 on Tuesday.

Reports on Collateral Research Projects

LEARNING FROM TEXT PROJECT: RESEARCH STUDY

The Relation of Topic Familiarity, Textual Cohesion, and Syntax to the Ability to Read

Diane Lapp and James Flood

San Diego State University

Harry Singer, Director

University of California, Riverside

PURPOSE

The purpose of this study was to investigate the relation between student's prior knowlege, syntactic competence, textual cohesion and college reader's comprehension of cause-effect expository texts designed to assess three varibales: topic familiarity (as a measure of knowledge), cohesion (as a measure of discourse structure type) and syntax (as a measure of language development).

RATIONALE

Educational researchers have found that two separate factors play integral roles in the comprehension of all texts: prior world knowledge of topic (Singer and Donlan, 1982; Anderson, Spiro, and Anderson, 1978; Spiro, in press) and syntactic competence of the reader (Menyuk, in press). A third factor, the cohesion of the text, has also been found to be an important factor in reading comprehension (Halliday and Hasan, 1976; Hasan, in press; Meyer, in press), but its effects have not been reported by specific discourse type, e.g. cause-effect expository, temporal expository, topic expository.

This study examined the relations among these three variables and their correlates to reading achievement. Specifically, the study examined the relation of reading achievement to comprehension of cause-effect texts manipulating three variables: familiarity of text content, explicitness of cohesion within the text, and complexity of syntax.

METHODOLOGY

Sample

Forty-eight students attending community/junior colleges in the San Diego area participated in the study. Students were randomly selected from Sophomore-level Political Science courses for the study. The reading achievement scores of the twenty-four students, as measured by the STEP Reading Text, ranged from below average to above average to ensure a varied sample. The second set of twenty-four students were selected to match the scores of the first set of students.

Materials

Two separate texts with four versions of each text was designed for this study. Each text consisted of a cause-effect expository treatment of familiar content (changing marijuana laws) or unfamiliar content (drug laws in American History). Each of the texts, familiar and unfamiliar, had four versions:

1) explicit cohesive devices, with simple syntax
2) explicit cohesive devices, with complex syntax
3) implicit cohesive devices, with simple syntax
4) implicit cohesive devices, with complex syntax

Twenty (20) questions were written to assess students' overall comprehension of the text, their knowledge of topic, their knowledge of cause-effect discourse structure, and their ability to deal with simple-to-complex syntactic structures.

Procedures

Each students was assigned two different texts, from among the eight texts, one was familiar and one unfamiliar. At the completion of the reading, they were asked to write a free recall of the text. This was followed by 20 questions that required short answers (one word; a phrase; a brief sentence).

Design

A 2x2x2 between subjects factoral design was used in this study. The factors included: topic familiarity, text cohesion and syntax.

Analysis

ANOVA techniques as well as stepwise regression analyses were used to determine the relation of reading achievement to text type. The effect of each variable was also analyzed separately to determine the amount of variance that each contributed to the total performance of each student.

It was found that syntax contributed most significantly to performance i.e. the texts containing difficult syntax, were the most difficult to process for all students.

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Appendix A

Sample Text

Unfamiliar Topic, Implicit Cohesion, Easy Syntax

"Drug Laws in American History"

Drug laws are a new part of American history. At the start of this century opium, like heroin and morphine, were used by many people. Some experts say that one American in twenty was a heavy opium user. Cocaine and marijuana also were used in parts of the country.

People thought that the use of drugs was evil, and certain laws were changed. The Harrison Act banned all narcotics in 1914. The law meant that opium products, morphine, heroin and upper cocaine would be included. The 18th amendment banned alcohol use. Public outcry took back this law in later years. Few people cared about drug laws before that time.

The Harrison Act stayed in effect. And, this act became the basis of new drug laws. Soon, courts jailed drug users with the harsh laws.

Passing the 1937 Marijuana Tax Act caused marijuana sellers to go to jail for a very long time. Catching a person with marijuana could jail him from 7 to 20 years, and catching this same person a second time could jail him from 10 to 40 years.

More laws also increased the penalities for drugs and cocaine. The unknown effect of these laws was to encourage the sale of drugs by underworld dealers. Banned alcohol led to "rum-running" and illegal whiskey stills. Harsh drug laws encouraged large smuggling rings with world wide networks.

Today, most drugs are used in a country other than the one in which they are grown, even if they are outlawed in both countries. Opium comes from Asia and Mexico, cocaine comes from South American, and marijuana comes from many countries.

The Effect of Manipulative and Metacognitive Questioning on High School Students' Learning from Expository Text

Tom Bean, Harry Singer,
Jack Sorter, and Charles Frazee

ABSTRACT

Title: The effect of manipulative and metacognitive questioning on high school students' learning from expository text

The purpose of this study is to determine if high school students can become proficient in asking their own text-related questions (versus teacher-posed questions) to improve comprehension of expository text in 10th grade World History.

A control group (n=40) will be involved in the manipulative or instructor-devised condition. These students will read the text chapter or section which has been subdivided at key structural points. Students will be instructed to stop at these key points and answer in writing, text-specific interspersed wh-questions developed by the teacher. This process will be employed for six trials, the first two comprising learning trials. Copies of students' question responses will be retained for quantitative and qualitative analyses.

A treatment group (n=40) will be involved in the metacognitive or self-generated question condition. Prior to reading the text, students will receive instruction in their text's dominant structure and related schema-general questions. Students will be instructed to stop at key structural points in the text and generate in writing three text-specific questions and responses using the schema-general guide. Following each of the six text readings, both control and treatment group students will complete the same 10 item quiz.

The study is scheduled to run in the Fall, 1982 term with subsequent follow-up measures in a longitudinal design.

MAXI-GRANT CATEGORY 1.

SUMMARY OF PROPOSED PROJECT

Title: The effect of manipulative and metacognitive questioning on high school students' learning from expository text

Purpose

To determine if high school students can become proficient in asking their own text-related questions to improve comprehension of expository text. Students will be enrolled in 10th grade World History classes at Garden Grove High School. The class sections involved are designed for gifted and talented students taking college preparation courses.

A longitudinal study might follow experimental and control group students from the proposed 1982-83 project to determine transfer effects in subsequent classes at the high school and college levels (external funding sources are being explored through Dr. Marlene Rios, HDCS Grants Specialist).

Background

The use of interspersed questions in expository text constitutes a manipulative, publisher or teacher-devised aid to comprehension (Andre, 1979; Ford, 1981). In contrast, metacognitive strategies include student-derived questions generated during text reading (cf. Singer and Donlan, 1982). Both manipulative and metacognitive strategies undoubtedly increase depth of processing and retention of

1.4 Identify major concepts and important details in at least the first six chapters or appropriate sections of the text.

1.5 In collaboration, compose a series of text specific interspersed questions (paraphrased wh-style) for at least the first six chapters or sections of the text. This constitutes the manipulative portion of the project.

1.6 Compose a series of schema-general wh-questions (e.g. who; what; why). These will be used for the metacognitive portion of the project.

1.7 Compose six 10 item wh-multiple-choice quizzes and validate the passage dependency of the items with a small pilot sample.

2. Implementation Phase during Fall, 1982

2.1 Identify students for experimental and control conditions (n=40/condition). Screen students for equal reading achievement in both groups (stanines 4-6).

2.2 Randomly assign by class to one of the following two conditions:

Control

This group will be involved in the manipulative or instructor-devised condition. These students will read the text chapter or section which has been subdivided at key structural points. Students will be instructed to stop at these key points and answer in writing,

text concepts (Andre, 1979). However, as students progress from high school to college they are epxected to become increasingly proficient in metacognitive strategies (McCurdy, 1981). The following project is designed to introduce high school students to metacognitive strategies and compare this approach to a more traditional, teacher-directed questioning approach. Project staff include a high school history teacher as a consultant, a CSUF history professor familiar with guiding students' learning from text, the project director, and a student assistant to type materials.

Overview of the Short-Range Project

1. Planning Phase during Spring, 1982 (currently underway)

   1.1 Identify a high school history teacher (Mr. Jack Sorter, Garden Grove High School) and a university history professor (Dr. Charles Frazee) interested and able to consult on the project.

   1.2 Provide the history teacher with some background reading and instruction in text analysis, including identifying text structures relevant to the discipline (e.g. time order; attribute etc.).

   1.3 In collaboration with the history teacher and professor, identify superordinate and subordinate structures represented in the text.

text-specific interspersed wh-questions developed by the teacher and history professor. This process will be employed for six trials, the first two comprising learning trials. Copies of students' question responses will be retained for quantitative and qualitative analysis.

Following each of the six text readings, control group students will complete a 10 item wh-question multiple-choice quiz. Results will be returned to students the following day.

Treatment

This group will be involved in the metacognitive or self-generated question condition. Prior to reading the text, students will receive instruction in their text's dominant structure and related schema-general questions. Each student will receive a ditto copy of possible schema-general questions as in the following sample and related text passage (Chapin, McHugh, and Gross, 1974 reprinted in Singer and Donlan, 1980).

Text Structure	Sample Schema-General Questions
Attribute	What event has been described? Who was involved in this event? Where did this event occur? When did this event occur?
Cause-Effect	What caused this event to occur? What happened as a result of this event?

Sample Text Passage

The Declaration of Independence

Even when the war with England had been going on for more than a year, many colonists still hoped for a peaceful settlement. Some in the middle colonies were reluctant to commit "treason" and break permanently from England. On the other hand, in the Contenental Congress the delegates from Virginia and New England favored an official declaration of independence.

Then in January, 1776, Thomas Paine, an newly arrived immigrant from England...

STOP

Control Group	Treatment
Answers text-specific, teacher generated interspersed questions	Generates and answers text-specific interspersed questions using schema-general guide to generate questions

Students in the treatment group will read the text chapter or section which has been subdivided at key structural points. Students will be instructed to stop at these key points and generate in writing three text-specific questions and responses using the schema-general qeustion ditto as a guide. This process will be employed for six trials, the first two constituting learning trials. Copies of students' questions and responses will be retained for analysis. Following each of the six text readings, treatment group students will complete the same 10 item quiz as the control group.

The resulting data will be analyzed for significant differences in control and treatment group means as well as qualitative information relating to question type and quality of response.

Other variables that may be explored within the short-range study include students' perceptions of the control and treatment strategies using Likert scale items and follow-up interviews, teacher perception of these strategies, and the quality of classroom discussions via field-notes and discussion map analyses (Bean, 1981).

Budget Items

Released time for the project director and CSUF history professor at one course each for Fall, 1982 and Spring, 1983 (.4/semester total).

Honorarium for the high school history teacher.

Student Assistant funds.

Supplies and copying funds.

Travel to and from the high school.

The total budget will be between 15,000 and $25,000.

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The Effect of Diagrammed Paragraphs on the Comprehension and Recall of History Text Among University Students: An Exploratory Study

Dan Donlan
Harry Singer
Carlos Cortes
University of California, Riverside

The ability to differentiate between the significant and the non-significant in text tends to separate proficient readers from ineffective readers. Much time and effort has been spent exploring teaching methods that will help students recognize main ideas in textual passages (Olson and Ames, 1972; Karlin, 1972; Robinson, 1975; Shepherd, 1978). The word teach is crucial: If students cannot on their own locate main ideas, it is futile to ask them to do so without teaching them specific comprehension strategies.

The traditional method of locating main ideas has been to find "the topic sentence." However, Braddock (1974) found that only thirteen percent of the topic sentences in representative passages from modern prose are located at the beginning of the paragraph, the place where many students are asked to look for them. In fact, Burmeister (1978) and Singer and Donlan (1980) have shown that topic sentences can be found at the beginning, the middle, or end of the paragraph; sometimes the topic sentence is missing or implied.

College and university instructors of content courses frequently assume that students are independent readers. In an informal study conducted with a group of 22 graduate students, it was found that the students had difficulty locating the topic sentence if it was not in the initial position (Donlan, 1980). This suggests that ideational relationships existing among sentences in a paragraph may be subtle and complex.

Christensen (1967) developed a diagramming system for analyzing paragraph structures of noted writers in an attempt to teach students better writing. The system, referred to as generative rhetoric, used numbered sentences and identation to diagram idea relationships within a paragraph. Here, for example, is a simple paragraph and its correlated diagram:

> Uncle Joe owns four hats. One is brown. It is old and has grease spots. The other three hats are gray.

1. Uncle Joe owns four hats.
    2. One is brown.
        3. It is old and has grease spots.
    2. The other three are gray.

The main, or most general sentence, concerns four hats and is labeled 1 and placed in the extreme left position. One is brown is subordinate to four hats; it is labeled 2 and is indented. Old and grease spots is subordinate to one is brown; it is labeled 3 and is indented even further to the right. Other three are gray is labeled 2 because it is subordiante to four hats.

Here are other paragraphs diagrammed according to Christensen's generative rhetoric of the paragraph:

The apartment's refrigerator was a mess. The top shelf was dirty. A tomato had been squashed through the grating. Red smears were on at least half of the grates.

1. The apartment's refrigerator was a mess.
2. The top shelf was dirty.
3. A tomato had been squashed through the grating.
4. Red smears were on at least half of the grates.

Maps and graphs relay important information. Vocabulary, sometimes confusing, relates key concepts in a chapter. Some vocabulary

2. Maps and graphs relay important information.
2. Vocabulary, sometimes confusing, relates key concepts in a chapter.

has a technical as well as a nontechnical definition. Some paragraphs are heavily detailed with no topic sentences. History texts are not easy to read.

3. Some vocabulary has a technical as well a nontechnical definition.
2. Some paragraphs are heavily detailed with no topic sentences.
1. History texts are not easy to read.

Horn (1973) adapted Christensen's (1967) new rhetoric by dissecting paragraphs to determine the idea relationships that exist within them. The dissection takes the form of diagramming paragraphs to show superordination and the levels of subordination. If passages were diagrammed for the students, their reading comprehension might be improved.

The Problem

Textbooks reflect the author's mode of organization. Idea relationships, internalized by the author, may not be clear to the reader. Graphic display of text--overviews, summaries, headings and paragraph indentations--is only occasionally helpful. However, understanding complete structures of ideas of a text remains the primary burden of the reader. Additional graphic assistance to the reader could take the form of paragraphs diagrammed according to Christensen's generative rhetoric. To test this prediction, an experiment was conducted to determine the effect of diagrammed text upon comprehension and recall. Hopefully, students would internalize a system for organizing ideas in a text according to their importance. Metacognitive theory and empirical research (Brown, 1981) would predict that this structural analysis would enhance retention of ideas in a text.

Investigators sought the cooperation of a history professor, who agreed to provide a text from his course in Latin American history. In addition, he agreed to solicit volunteers from his classes to

engage in the experiment. With student volunteers and a history text that could be presented in diagrammed and standard form, an experiment was conducted to test the validity of this proposition.

Students studying diagrammed history text passages would achieve significantly higher comprehension and recall than would students studying identical history text passages without diagrams.

Procedure

The Sample

Twenty students volunteered to participate in the experiment. Fourteen volunteers came from two upper division history courses; six were from the University's teacher education program. The students were randomly assigned to two treatment groups. Attrition claimed six students: two students attended no sessions; four dropped out during the treatment. Each treatment group was left with seven students, four from history classes and three from teacher education. As agreed upon earlier those volunteers who completed the treatment were paid twenty-five dollars.

The Treatments

The treatments, consisting of six one-hour sessions, had an identical session format, with the exception of the experimental variable. At the beginning of the session, students were given a 2500 word

excerpt from a chapter of Cuba: The Making of a Revolution by Ramon Edward Ruiz (New York: Norton, 1968). The experimental group's passage was diagrammed after Christensen (1967) and Horn (1973). The control group's passage was identical, except it was typed single-spaced without diagrams. Students were given one minute to preview the text for main ideas. Next they were allowed 10 minutes to read the passage. If they finished before 10 minutes, they were instructed to review the passage. The texts were collected. Next, they were given paper and told to summarize from memory within 10 minutes what they had read. If they finished early, they were to review what they had written. These papers were collected. Finally, students were given a 20-item multiple choice comprehension test, also with a 10-minute limitation. The tests were collected, scored, and returned to the students at the start of the next session for brief review, and then collected again.

One minute prior to each session, students in the experimental group received brief instructions on how to read the diagrammed passages. During the sixth session, there were two departures from the daily regemin. First, since the sixth session was to constitute a post-test, both groups read from identical undiagrammed texts. Second, the test for the sixth session was increased to 30 items, for which participants were given an additional 5 minutes.

The Text Passages

Text passages were taken from Ruiz (1968). The text was required reading for one of the history classes from which students had

volunteered. However, the book had not yet been assigned, and the professor in charge did not lecture on the book or have it discussed in class.

Each passage consisted of approximately, the first 2500 words of one of the book's chapters. Chapters 1, 2,, 3, 4, 5, and 6 were used in sequence. The 2500 word length of the passages was to accommodate a 250 words/minute reading rate, which experimentors felt was reasonable for college students.

Post Treatment Evaluation

At the conclusion of the sixth session participants were asked to fill out a personal information form and evaluate the treatments, using a 5-point scale.

Results

To determine the effectiveness of the experimental treatment on comprehension, T-tests of mean scores were performed one each of the daily comprehension quizzes, as well as on the total score, based on quizzes 1-6. For this last T-test, all raw scores were converted to z scores. These data appear in Table 1. On quiz 6 the control group scored significantly higher ($p<.05$) than the experimental group. With respect to quizzes 1-5 and the combined total of quizzes 1-6, there were no significant differences ($p<.05$) although it should be noted, that on the first quiz there was a trend toward significance ($p<.06$) favoring the control group.

To determine the effectiveness of the treatment on amount of recall, T-tests of mean scores were performed on the length (#of words) for each of the six summaries the students had written as well as on the total number of words written, essays 1-6. For this last T-test, the numbers-of-words scores were converted to Z scores. Table 2 contains these data.

With respect to the first session's essay, the control group wrote significantly more than did the experimental group ($p<.05$). There were no significant differences between groups on essays 2, 3, 4, or 6. Also, with respect to the combined word count, essays 1-6, the control group wrote significantly more than did the experimental group ($p<.05$). On essay 5 the control group wrote significantly more than did the experimental group ($p<.05$).

Interpretation

Comprehension

At first glance, it appears that the reading of diagrammed passages had, at best, no effect on comprehension of history text and, at worst, a negative effect. Four explanations may account for this. First, Quiz 1 was measuring comprehension of the first encounter with the text. For students in the experimental group, this meant a new graphic display--diagrammed paragraphs. This could account for the almost significantly lower performance on the first quiz. Regarding Quiz 6, the experimental group was confronted with the standard

graphic display, not the diagrammed paragraphs as they might have expected. Both unexpected encounters with text could have interfered with comprehension.

A second explanation would be the lack of extensive formal instruction in reading diagrammed paragraphs. Only one minute of instruction per day was allotted to discussing the structures. Students in the experimental group may not have internalized the diagrams.

Third, there may have been a mismatch between the experimental treatment, which focused on structure, and the quizzes which focused on content.

Fourth, and most important, by chance, the control and experimental group were not initially equal. The control group scored higher throughout the experiment was exhibited less variability on each test.

Amount of recall was determined by the number of words each student wrote. That the control group wrote significantly more on essays 1 and 5 and on essays 1-6 combined, suggests either (1) that they were more fluent to begin with or (2) that the control treatment caused greater amount of recall.

Further Analysis of Data

To shed further light on the unpredicted outcomes, investigation returned to the personal information data and the program evaluation

data. Pearson's correlation coefficients were performed on these data and the total combined comprehension scores and total number of words written esays 1-6. Comprehension scores correlated significantly and positively only with the years of schooling the college student had (.73, $p<.002$). Writing totals correlated significantly and positively with the number of history courses a student had (.56, $p<.037$), with their attitude toward writing as being helpful (.71, $p<.004$).

Generally, students tended to perform better (a) if they were in the control treatment, (b) the more years they had in college, (c) the more history courses they had, and (d) the more positive their attitude about writing.

Next Study

This was an exploratory study to develop the procedures and test the materials. In the next study, we plan to do the following:

1. Randomly assign a larger sample of students to both groups.
2. Provide more adequate instruction in diagramming, including not only explanation but also practice and evaluation.
3. Use another experimental group which will not only diagram the structure of the content, but also study the content itself. In short, they will learn to comprehend both structure and content. The structure will become a knowledge framework for the content.
4. Finally, if pre-treatment significant differences exist

among randomly assigned groups--as they did in this study--analysis of covariance will be used to adjust the differences.

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Figure 1. Mean scores of six comprehension tests, by treatment group

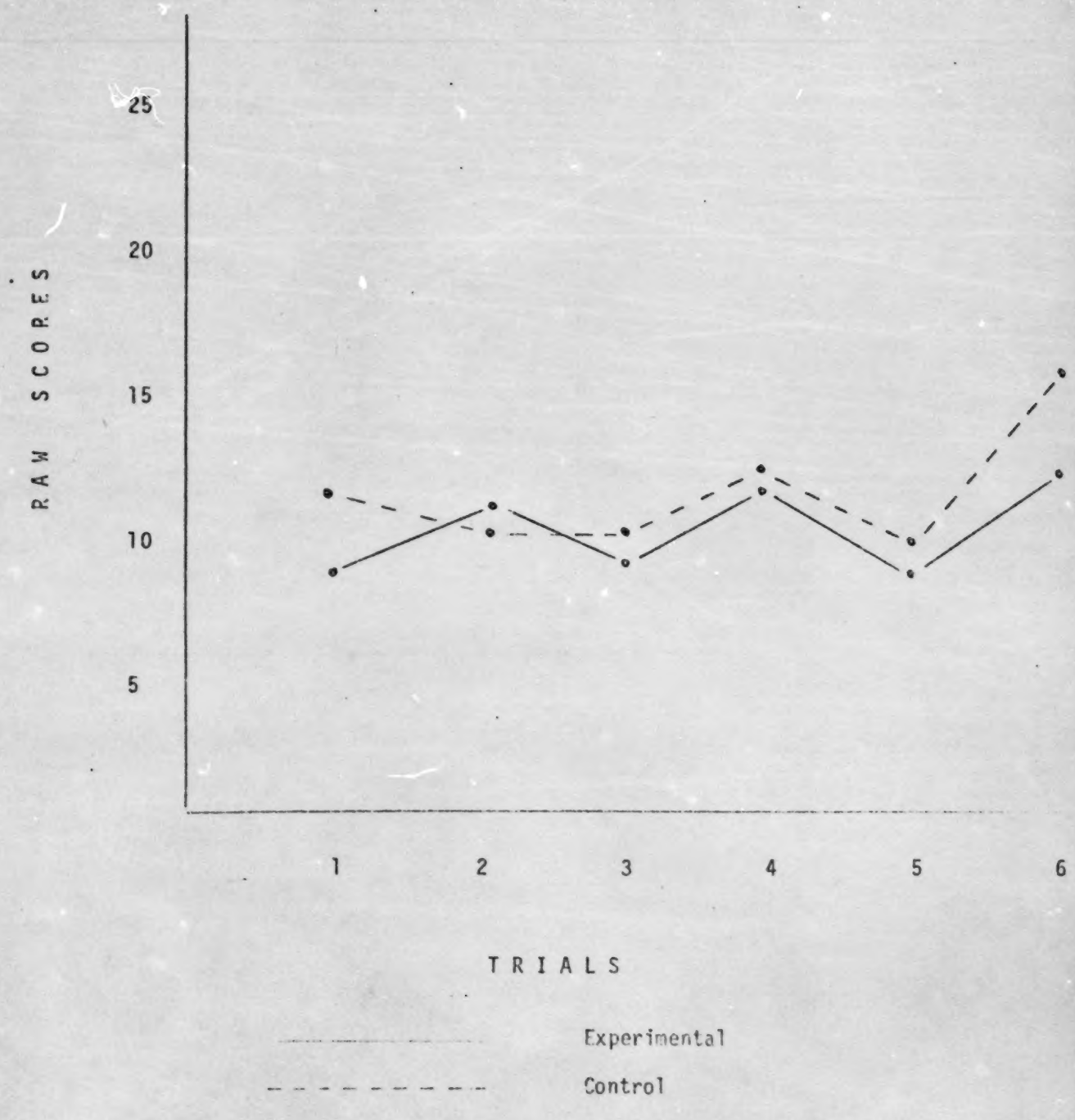

Figure 2. Mean number of words on six essays, by group

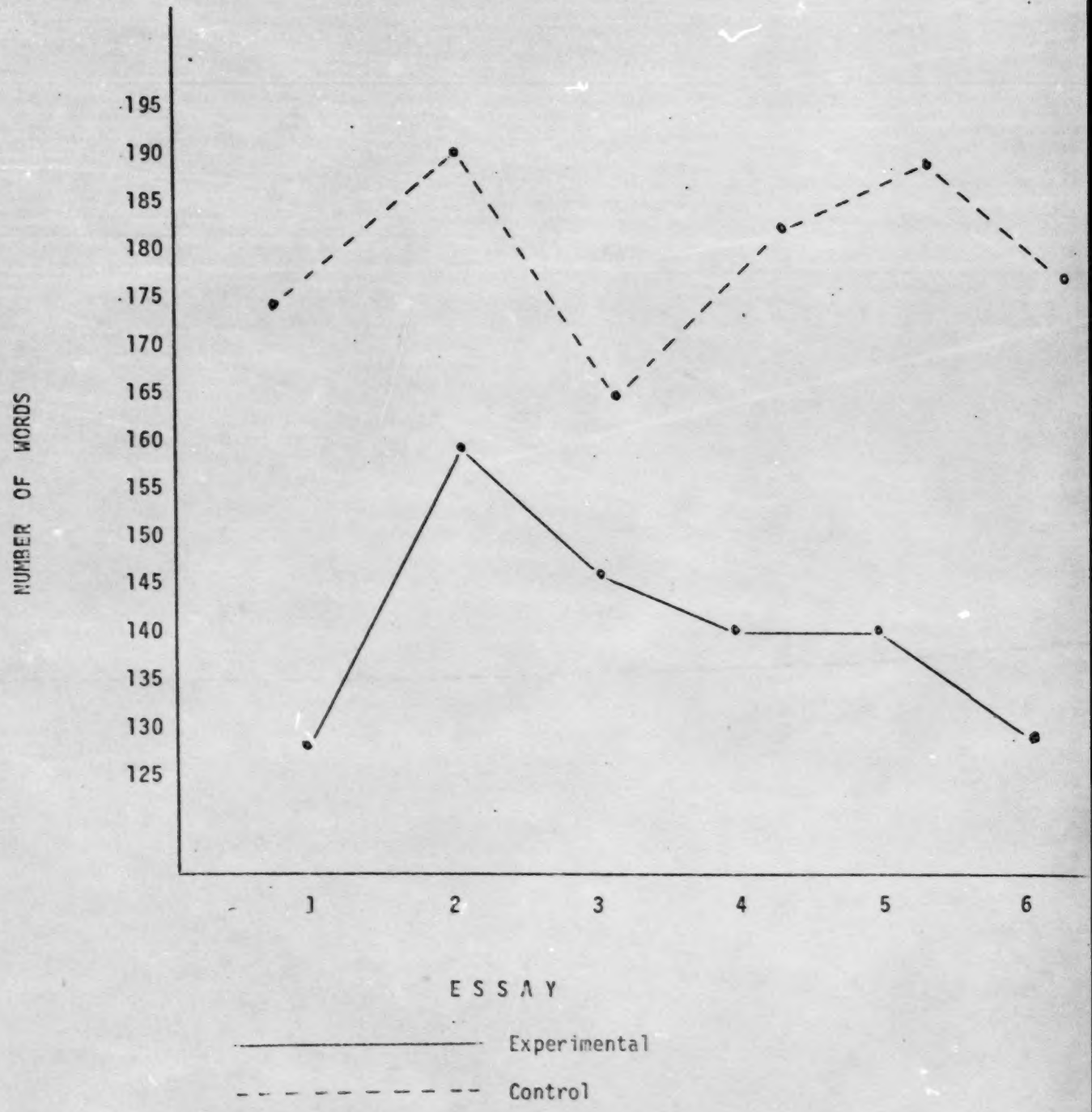

Table 1

Results from T-tests on Mean Scores from Comprehension Quizzes 1-6, and Σ Score of 1-6, Converted to Z scores, by Group

	QUIZ	$\bar{X}$	SD	T-value	Sig.
exp	1	7.6	4.1	2.1323	ns
con		11.4	2.3		
exp	2	11.9	3.2	0.1990	ns
con		11.6	2.0		
exp	3	9.7	3.0	0.6211	ns
con		10.7			
exp	4	12.7	2.2	0.3929	ns
con		13.3	3.1		
exp	5	9.4	3.2	1.2302	ns
con		11.6	3.2		
exp	6	13.0	4.7	2.2577	< .05
con		18.0	3.5		
exp	1-6	1.57	5.2	1.2786	ns
con	(Z scores)	1.57	3.9		

Table 2

Results from T-tests on Mean Scores from Essay Word Counts

for Sessions 1-6 and Σ Word Count Sessions 1-6, Converted to Z Scores, by Group

	Essay	$\bar{X}$	SD	T-value	Sig.
exp	1	128.6	47.9	2.2577	< .05
con		174.7	60.2		
exp	2	160.8	51.3	1.2730	ns
con		189.6	30.5		
exp	3	145.4	43.4	0.9599	ns
con		167.4	42.3		
exp	4	140.7	29.4	0.3561	ns
con		183.7	22.9		
exp	5	141.8	28.8	2.7369	< .05
con		187.4	23.3		
exp	6	131.7	57.9	1.8211	ns
con		177.7	33.2		
exp	1-6	2.685	5.0	2.1970	< .05
con		2.464	3.5		

Learning from Text Project

LFT

Projector Director
Harry Singer
UC Riverside

Associate Director
Tom Bean
CSU Fullerton

October 1982 Vol. II, No. 1

LFT Review

Text Selection

Pat Phelps and Harry Singer
University of California, Riverside

Three instrucional tasks are: deciding on goals for a course, selecting a textbook for those goals, and guiding students towards realization of the goals. Once the instructor has formulated the goals for the course, the next problem is choice of a text. The instructor, operating at an expert level, has a difficult task in choosing a text appropriate for the student, who is operating at a novice level. The expert's mental representation is abstract and flexible, with a mastery of underlying principles generalized from long experience. The novice's, in contrast, is a collection of concrete examples. Although many factors have to be considered in this dichotomy, three major ones are the text's level of abstraction, its instructional devices, and its organization. We shall review studies which focus on these three characteristics of text.

Level of Abstraction

Pepper (1981) evaluated two technical texts on computer programming. The professors who taught the course preferred the text with a concise, outline style while the students preferred the one with the conversational style. Students at all ability levels stated that the examples provided in this text were more useful to them than were the explanations and discussions.

From the students' comments, the following list of suggestions were drawn:

1. Make sure terms are defined and used consistently
2. Start at a level consistent with students' prior knowledge
3. Provide lots of illustrative examples

The students' suggestions served as guidelines to the writing of an experimental chapter. Those who read the experimental chapter performed better than the two groups who read equivalent chapters in the other two texts. Ratings for the experimental chapters were significantly higher than ratings for the other texts on readability, effectiveness, and organization.

Pepper's most important finding was that copious systematic use of examples is a powerful way to bridge the gap between the expert and novice, between the knowledge they bring to the course and the new knowledge the course is trying to develop. The examples in the text give students a specific mental picture to which they can anchor abstract explanations. In short, the student can begin to link what they already know to what they are learning.

Instructional Devices

Expository texts employ instructional devices to facilitate comprehension. The students are kept active while reading by performing tasks posed by the text (Glover, Plake, & Zimmer, 1982). The students' store of schemata available to them for solving problems is increased by presenting a typology of problems and providing models for their interpretation and solution (Mayer, 1982). Thus texts can not only explain but also teach.

Organization

Structure of text as vehicle for the content is also important for comprehension. For example, Frase (1969) presented chess information that was organized either by concept (i.e., name of chessman), by attributes, or randomly. Subjects who read passages organized by concept scored better on such indices as accuracy of recall and ability to produce an organized free recall protocol. This study indicates that a natural way to organize information is by semantic maps, that is, presentation of information by concept with all its properties grouped together. This organization may be compatible with the way individuals organize information. Therefore, when information is already organized this way, it is easier to comprehend and retain.

The same explanation also operates for paragraph-sentence relationships. For example, Rothkopf and Koether (1978) found that comprehension improved when topics and their related sentences were grouped together.

Although organization of text can facilitate or interfere with comprehension, modification of a merely stylistic nature, such as sentence length, may be of minimal significance compared to the overwhelming impact of content factors, such as novel information (Johnson & Otto, 1982).

Thus, in selecting texts for their students, instructors have to attend to the level of abstraction of the content, the text's instructional devices, and its organization.

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LEARNING FROM TEXT PROJECT

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Project Director
Harry Singer
UC Riverside

Associate Director
Tom Bean
CSU Fullerton

October 1982

Volume II, No. 1

LFT Abstracts

Contemporary Educational Psychology

"Effects of word frequency and number of meanings for fast and slow readers." Contemporary Educational Psychology, April 1982, 7(2):195-200.
James E. Jastrzembski and Rob Wittes

Using a lexical decision task, the effects of frequency and number of meanings are investigated for fast and slow readers. It is shown that different patterns of results emerge for fast and slow readers. For fast readers there are general effects of both frequency and number of meanings; for slow readers the effects are considerably attenuated.

Journal of Educational Psychology

"Distinctiveness of encoding and memory for learning tasks." Journal of Educational Psychology, 1982, 74(2):189-198.
John A. Glover, Barbara S. Plake, and John W. Zimmer

A distinctiveness of encoding hypothesis, as applied to the facilitative effects that higher order objectives appear to have on readers' recall for prose, was evaluated in three experiments. An additional purpose of these experiments was to test the effects of different levels of difficulty of decisions during encoding, using an externally referenced difficulty-of-learning task hierarchy. In a series of identification tasks, decisions about higher order objectives proved to be more difficult and resulted in higher levels of recall than did decisions about lower order objectives. Specific controls for processing time, processing ability, and meaningfulness of material did not alter the overall results. The discussion suggests that distinctiveness of encoding may offer a theoretical basis for the effects of adjunct aids as well as a guide to their construction.

"Memory for algebra story problems." Journal of Educational Psychology, 1982, 74(2):199-216.
Richard E. Mayer

In Experiments 1 and 2, subjects read a series of algebra story problems and were asked to recall each problem. In Experiment 3, subjects were asked to construct problems. Results [illegible] (a) Proposition structure: Propositions about relations among variables were more likely to remember than propositions that assigned a value to a variable, subjects were far more likely to convert a relation into an assignment than vice versa, and assignments outnumbered relations 25 to 1 for constructed problems. (b) Problem schemas: Recall was better for schema-relevant than schema-irrelevant information and for common problem types than uncommon ones, and subjects tended to convert uncommon problem types into common types and to construct common rather than uncommon problem types.

Memory & Cognition

"Effects of spacing and embellishment on memory for the main points of a text." Memory & Cognition, March 1982, 10(2):97-102.
Lynne M. Reder and John R. Anderson

An advantage has been found for acquiring textbook knowledge by studying textbook summaries rather than reading the original prose (Reder & Anderson, 1980). Three studies are presented that help to establish the cause of the summary advantage. One possible cause is that reading summaries allows the subject to reread the main points at spaced intervals, and spaced practice is superior to massed practice. A second possible cause is that the presence of details distracts the subject's attention away from the critical ideas that should be attended to. In Reder and Anderson (1980), these two factors were confounded, but they are unconfounded in the present studies. The results indicate that both possible causes, spaced practice and the absence of details, have significant, independent, and positive effects on retention of the central ideas of a passage.

"Effective elaboration and inferential reasoning." Memory & Cognition, 1982, 10(2):188-193.
C. Donald Morris and John D. Bransford

The present study investigated the effects of several variables on subjects' abilities to draw inferences from two related premises. Contiguous presentation of the related sentences led to significantly higher inference scores than did noncontiguous presentation. The nature of the initial premise was also manipulated. For some subjects, the initial premise was relatively consistent with subjects' semantic knowledge, whereas other subjects received initial premises that were somewhat arbitrary with respect to semantic knowledge. Inference scores were significantly higher for subjects who received the more consistent initial premises. This effect persists even when differential memory for the initial premises has been accounted for. The results suggest certain constraints on the nature of the knowledge one must possess in order to make appropriate inferences from material.

Reading Improvement

"Paragraph processing: A direct-functional interactive model." Reading Improvement, Spring 1982, 19(1):13-24.
Clyde G. Colwell

In relation to reading comprehension there is a movement to analyze specific semantic units such as the morpheme or the individual word. The present study treats the paragraph as a semantic unit in connected discourse and analyzes post methods to promote understanding. A new model intended to facilitate the processing of ideational relationships within a paragraph is proposed. The model consists of three distinct parts: 1) direct teaching, 2) functional application, and 3) increased interaction with the text. Students in selected seventh-grade social-studies classes were utilized as subjects. The study crossed two treatments (control and experimental) with three achievement levels (high, average, and low). The results supporting the experimental model were most consistent within the average achievement level. Educational and research implications are presented.

Reading Research Quarterly

"The effect of sentence manipulation on subsequent measures of reading and listening comprehension." Reading Research Quarterly, 1982, 17(3):339-352.

Stanley B. Straw and Robert Schreiner

WRITERS IN LANGUAGE development have identified the importance of grammatical (sentence structure) knowledge to the following areas of language processing: listening, speaking, reading, and writing. It has been suggested that instruction in one of these four areas aimed at increasing grammatical knowledge should produce gains in other areas. Results in the research literature have shown significant gains in syntactic fluency on the part of subjects who received a synthetic method of grammatical instruction, such as sentence-combining, over analytic approaches, such as formal grammar instruction. The purpose of this study was to compare the effects of a synthetic approach in teaching writing to analytic approaches on growth in listening and reading. One hundred twenty-four grade four students were instructed in one of three methods: sentence-combining (synthetic), sentence-reduction (analytic), or element identification (analytic). One of two instructors taught each of the treatment conditions. Subjects were blocked according to reading ability as determined by a pretest measure. Measures included two measures of reading growth, one measure of listening growth, and assessments of writing growth. Analyses of covariance and subsequent post hoc analyses on the data indicated a significant difference of the sentence-combining group over the textbook group on all measures except the standardized test of reading comprehension. Subjects in the sentence-reduction group performed significantly better than the textbook group on only the cloze test of reading comprehension. Conclusions and implications are drawn from the analyses of the data and discussed.

These abstracts are distributed to Campus Coordinators, Content Consultants, and Advisory Board Members of the UC and CSU Learning from Text Project, and to interested personnel on each UC and CSU campus. Any members of the UC and CSU systems who want to be on the mailing list for these abstracts should write to the Learning from Text Project, c/o Dr. Harry Singer, School of Education, University of California, Riverside, 92521.

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